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Governing Corporate Environmental Sustainability: The case of Speedline S.r.l.

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INTRODUCTION

The increasing number of companies arising after the industrial revolution, has been creating significant damages for the environment. Due to their production activities, problems like waste and pollution emission have been becoming even more relevant. Authoritative organisations have been undertaking initiatives to promote a more sustainable approach for individual and companies of the world. They are also providing scientific reports with the scope of alarming governments about possible future dangerous scenarios of global warming effects generated by human activities. Thanks to the process of environmental sensitization, governments have been implementing environmental policies toward companies, which are considered to be the main cause of pollution emission.

In this work, environmental policies are considered at European and national level. The problem stems from the fact that companies should conduct a less impactable business, without compromising their economic performance. They are forced to reduce their greenhouse gas emission, especially those of CO2, to meet new environmental regulation requirements and to satisfy new customer demand. This thesis investigates how do companies apply carbon strategies in response to external pressure made by environmental policies and initiatives. Relying on Damert et al (2017) theoretical framework, it has been made a qualitative analysis of a case study. The investigated company is Speedline S.r.l., which is located in the Venice county and operates in the mechanical engineering industry. The objective of this study is to identify the main determinants, outlined in Damert *et al.* (2017) framework, which favours good outcomes of Speedline's corporate carbon strategy.

The work is made up of five chapters: the environmental issue and the role of companies, the corporate carbon strategy framework, the research methodology, the case study and conclusions.

The first chapter gives a general overview of the environmental issue. Environmental threats – along with climate change -are one of the key issues at the global level which ask for an urgent debate and resolution. Many protest actions have been taking place to stimulate public opinion about negative consequences arising from climate change. The case of Greta Thunberg is one of the most representative environmental sensitisations started from common

people. In this case, Greta Thunberg has involved many children students of the world to go on strike for environmental reasons. Another example concerns the London mobilization organised by the extinction Rebellion Group. The scope of the mobilization was to force the UK government to undertaken policies aiming at reducing carbon emission. Individual and collective protests like them, have reached media attention and international organisations' initiatives. The justifications of such actions are based on the threat of probable future negative impacts on the environment due to climate change. Important international organisations like the United Nations and the Intergovernmental Panel on Climate Change have been reporting climate change implications and have been influencing governments to mitigate the problem. From the latest climate change report, report Global warming of 1.5°C, it is shown that after industrialisation, the increasing trend of carbon emission due to human activity, especially because of companies' activities, have been compromising the natural environment all over the world. Through this report, scientists have been informing governments that whether global warming will be higher than 1.5°C in 2030, important negative consequences will take place. Many international entities have been undertaking initiatives to give their contribution in climate change mitigation. Among others, the United Nations Framework Convention (UNFCCC) has established international agreements in which many countries of the world have adhered. Its last treaty is the Paris Agreement, where targets for pollution reduction among member have been established. Other organisations like Global Reporting Initiatives have been helping companies to disclosure their voluntarily environmental activities. They provide unique standards to create a non-financial report. Since the main pollutant element is CO2, this thesis focuses mainly on carbon emission. Other entities like the Carbon Disclosure Project Ltd, help companies evaluating their carbon performance through the carbon footprint method and reducing their carbon emission. Due to these interventions, many institutional governments around the world have been taking a strong position for this purpose. Environmental policies are analysed under European and Italian perspective. Relying on the Treaty of Functioning of the European Union (TFEU) and the Treaty of European Union (TEU) documents, some important articles concerning sustainable and environmental development over the Eurozone have been described. Italian constitution recognizes and implement European

environmental policies too. The authorized institution for the application of environmental rules in Italy is the Italian Ministry of the Environment. An important plan, called Informazione Educazione Ambientale (INFEA), is applied by the Italian Ministry of the Environment at regional level. In this way, environmental policies are decentralised and will be more applicable to companies.

Chapter two describes theoretically the corporate carbon strategy based on Damert *et al* (2017) study. This type of framework assumes external and internal determinants as contributors for the realisation of the corporate carbon strategy. External determinants are: stakeholders and institutional pressures and voluntary environmental disclosures implementation, while internal ones regard all factors concerning organisational resources. The theoretical corporate carbon strategy framework consists of three main pillars: Carbon governance, Carbon reduction and Carbon Competitiveness. They represent the main strategic objectives and each of them are linked with some related corporate activities. The first strategic objective, carbon governance, regards internal organisation's managerial capabilities in the resolution of climate change issues. Activities related to this objective are: Organisational involvement and risk management. To explain the first activity, it is taped from the literature of organisational learning, employee business awareness and the difference between the figure of the manager and leadership. In second activity, risk management, it is firstly highlighted the relevance of environmental risks. According to the literature of the enterprise risk management, a short guidance on how managing environmental risks within a company is outlined. Carbon reduction is the second pillar of Damert *et al* framework. The first activity related to this strategic objective is carbon measurement & policy. In this context, it is described a methodology for an optimal tracking control of carbon emission to follow preestablished targets. It is also mentioned the Life Cycle Sustainability Assessment, a broader method which monitors and evaluates firm's sustainable performance. Product improvements is a further activity related to carbon reduction. Literature involved in this activity is the European Ecolabel which identifies and promotes sustainable products, then the characteristics of the recycling process are outlined. The third activity of the second pillar is process improvements, which in turn is linked with concepts like: Best Available

Techniques and Green Supply Chain Management. The latest activity related to carbon reduction is carbon compensation. This methodology, aimed at discouraging carbon emission, is regulated by the Emission Trading System in the eurozone. The third pillar, Carbon Competitiveness, is related to four activities. The first one is New Markets & Products. Here, environmental innovation is demonstrated to be effective through R&D cooperation. The second activity concerns stakeholder engagement. Most common stakeholders like the World Business Council for Sustainable Development and UN Global Compact are cited to highlight the importance of stakeholder's engagement for sustainable companies. Corporate communications, an increasingly important business activity, talks about international non-financial reports. Disclosing through reports like: The Corporate Sustainability Report, the Q-RES Project, the carbon Disclosure Project and the International Integrated Reporting gives guidelines to conduct and communicate corporate environmental activities. Political activities are related to the internal environmental rules by which a company as adhered. Environmental standards for the Environmental Management System, the Environmental labels and declarations, Environmental Evaluation Performance and the carbon footprint are described.

In chapter three it is outlined the methodology adopted for the investigation of the case study of Speedline S.r.l. In this work, the way through which the analysis has took place is based on a qualitative research. According to the research question and the objective formulated, a description of causes that has led the investigated company to undertake specific actions, should be vital for the analysis. Gathering qualitative information help to understand the strategy adopted by the firm, taking into account constraints like its sector, its size and the area in which it has been operating. Speedline, the investigated company, was submitted to a questionnaire of 57 questions. Such questionnaire was created with the support of the literature of chapter 2. Following the theoretical corporate carbon strategy of Damert *et al.* (2017), the structure of the questionnaire was defined. Answers given by the SMEHS manager of the company, were interpreted and elaborated by integrating the related literature. Only the most relevant answers were cited in a direct form. Before the interview, it was possible to analyse the entire allow wheels production process. Through data obtained from a direct observation and interaction with the environmental responsible of the

firm, I had sufficient elements to interpret and formulate Speedline carbon strategy and the contribution of its main determinants.

Chapter four concerns the case study of Speedline S.r.l. Speedline's main activity concerns alloy wheels production. Other details concerning the company are outlined and then information about its carbon strategy are elaborated. Speedline's carbon governance is based on an internal culture which allows the involvement of each internal stakeholder for the achievement of a good carbon performance. Its leading group provides to Speedline some guidelines through the Planblue project. Carbon reduction is considered to be very efficient, especially because of the use of best available technologies which are few impactable. Moreover, Speedline monitors carbon emission on a monthly interval. As far as carbon competitiveness is concerned, Speedline is not incentivised to reach new markets because of its sustainable activity. Due also to regulation pressure, Speedline is allowed to buy only sustainable materials and to sell sustainable products.

Chapter five regards conclusions. The way through which Speedline conducts the three main pillars of corporate carbon strategy, has been determining also an economical value added. However, the company is not already prepared to quantify, estimate and communicate such advantage and the relative environmental costs. By interpreting data gathered, Speedline' strategy consists essentially on minimizing consumption in the production process thanks to the high performance of its equipment. The main determinants identified for the implementation of such strategy are: regulatory constraints, employees' involvement, waste reduction and quality improvement (for both processes and products).

From the results it emerges the investigated company may increase its strengths points and overcome its weaknesses by starting to report its carbon activities and potentially join carbon reduction international initiatives such as Carbon Disclosure Project. They can also increase internal awareness through a major number of bottom-up environmental initiatives. Finally, they may engage into sustainability accounting system at the aim of economically quantify the environmental impact. Thus, affecting both economic and environmental management incentives and control systems.

The reasons for conducting a research on governing corporate environmental sustainability were essentially two. First, I noticed that this topic has led an increasing number of companies all over the world to carry out sustainable activities. Second, I have attended a Master's Degree Programme in Global Development and Entrepreneurship, an interdisciplinary course that aims at investigating peculiarities of the Global Development processes by integrating economic, managerial, geographical and cultural knowledge; hence, I wanted to understand how the environmental issue and such peculiarities coexist. In particular, I wanted to explore in which way corporate environmental sustainability is affected by: environmental management capabilities; the nature of the business activity; the geographical context in which a company operates; internal and external stakeholders' behaviour concerning internal business culture and supplier and customers pressure towards sustainable activities and products. Lastly, due to recent global awareness, I considered it timing to analyse also environmental regulatory constraints.

CHAPTER 1

ENVIRONMENTAL ISSUE AND THE ROLE OF COMPANIES

1.1. CLIMATE CHANGE

Climate change is "a long-term change in the earth's climate, especially a change due to an increase in the average atmospheric temperature"[1] and it is considered to be one of the today world's most important issue. This topic is becoming increasingly relevant and discussed. Around the world, there are a lot of initiatives of various nature which are trying to raise awareness to people about this emergency.

A current media topic is the case of Greta Thunberg. She is a 16 years old environmental activist from Sweden. Greta has started soon to conduct an ecological, sustainable lifestyle. Her story is very particular: she has been protesting every day for more the one month in front of the Swedish parliament based in Stockholm. To do this, she decided to skip school every day. This happened before the parliamentary election which took place on September 9th. After elections, she decided to strike in front of the Swedish parliament every Fridays, missing school only a day per week. During her strikes, Greta has benefited from the support of people like tourists who used to give her some food (The New Yorker, 2018). She is known to have launched the *school strike for climate movement*. After her environmental strike, where she had obtained media attention with the slogan: school strike for climate, now more than 20.000 students are protesting too. They are skipping school to strike like Greta is doing. All over the world, many students are giving up education for at least one day a week in order to spur politician to take radical measures for the resolution of climate issues. This movement is spreading even more and currently it is taking place in 270 towns and cities across the world (The Guardian, 2019). As well as for Greta, the other students are striking each Friday by their own cities. Greta's goal is to encourage politicians to undertake strong position for the resolution of

[1]Climate change. In *Dictionary.com,* Retrieved from: https://www.dictionary.com/browse/climate-change

environmental problems. She is going in most important and representative places, institutions and squares of the world greatest cities to draw attention against climate change. On 13th December 2018, she had the opportunity to take the conclusive speech in the United *Nation Katowice Climate Summit* (Democracy Now! 2019). She participated also to the event at the EU Charlemagne building in Brussels, where she pointed out that politicians are not doing enough to solve environmental problems (Miami Herald, 2019). Among various destinations, on April of the current year Greta was also invited for a 10 minutes speech inside the European Parliament (The Guardian, 2019). Thanks to the great impact Greta is having on the society, she has been nominated for the Nobel peace prize (The Guardian, 2019).

Another emblematic event which took place in England on Saturday 17th November, was the London mobilization. This event was organised by the Extinction Rebellion group. This is an international movement which adopts a pacific approach to highlight the gravity of current environmental risks. It is organised in smalls groups which communicate and interact via web (Extinction Rebellion, 2019). Members of such movement who were in 6,000 for that event, had occupied five bridges in London. Due to the disruption created, 85 strikers had been arrested. After police intervention, the Extinction Rebellion group moved to Parliament Square attaching a green flag on the Whiston Churchill' Statue. It is important to highlight that components of the group are very heterogeneous. Indeed, there were: scientists, teachers, students, parents etc. Extinction Rebellion group protested because it pretends that the UK government will implement net zero carbon emission by 2025 (Forrest A., 2018). At the same time, the government should abolish those policies that are not in line with such goal. Another important request made by the group was to institute an assembly where citizens are able to propose to the UK government new environmental policies (Forrest A., 2018).

These represent examples of individuals who have been voluntarily acting to fight climate change. Specifically, they are events where individual initiatives have been affecting political world. The process of sensitisation has been leading also authoritative international organisations to study and report climate change dynamics. As individual are doing, also such representative organisations are

forcing politicians to mitigate climate change too. After having briefly described the concept of climate change, we will further its dynamics.

According to the definition of climate change, its most important element is global warming. Global warming has aroused a lot of interest among the main international organisations, first of all United Nations (UN). UN cooperates with many organisations for the evaluation and the resolutions of worldwide environmental problems.

The Intergovernmental Panel on Climate Change (IPCC) is the UN body for assessing the science related to the climate change and it aims to make scientific data regarding the problem of climate change available. Thanks to the IPCC Fifth Assessment Report, published in 2013, we have come to know that human activities are the most significant factor that negatively affects climate change. The correlation between global warming and human actions is very strong. Therefore, UN has undertaken many initiatives to denounce this relationship and to encourage nations all over the world to solve this problem. First of all, we will see the latest reliable report on global scale and then we will focus on the various initiatives undertaken.

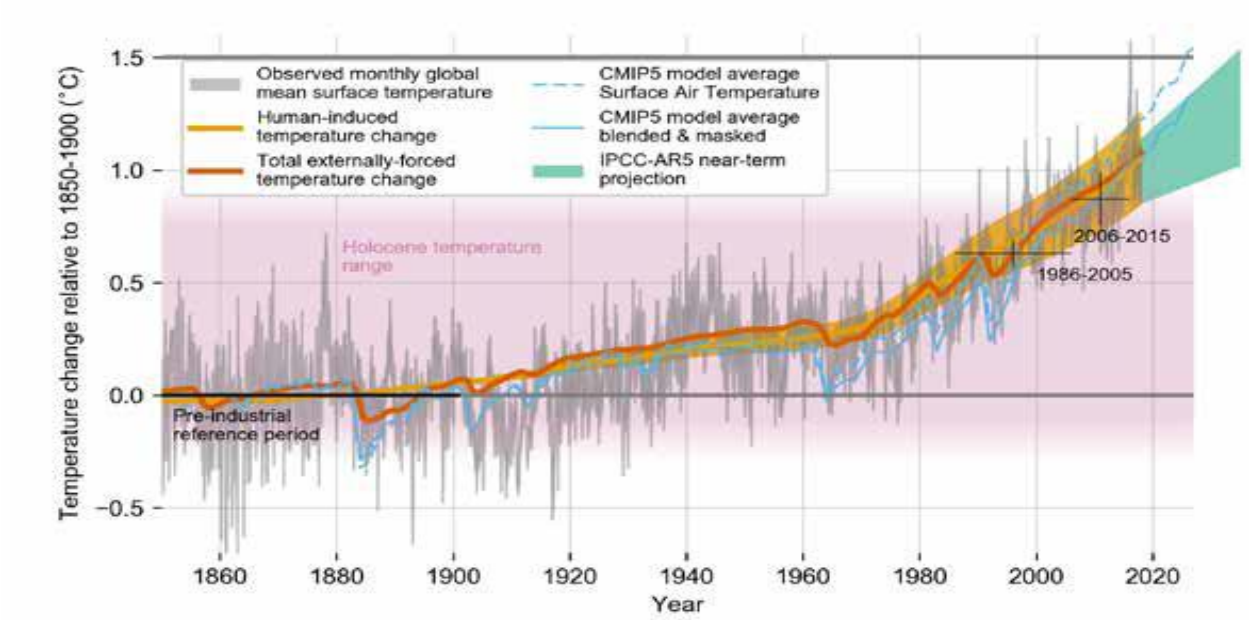
1.1.1. Global Warming of 1.5°C

To deeply understand the dynamics of climate change, in particular the trend of global warming caused mainly by human activities, we analyse the last IPCC report. The *Global Warming of 1.5 °C* is a scientific document written by IPCC and it's inside of the *Fifth Assessment Report* which is the last one that has been published. The first chapter of this document allows us to "understand the impacts of 1.5 °C global warming above pre-industrial levels and related global greenhouse emission pathways" (Allen *et al.,* 2018 p. 51). In this way we can discover how the worldwide environmental situation has changed since the industrialisation. Scientists declare that, due to the highest human influence on the Earth in the history, this period can be defined as *Anthropocene* (Allen *et al.,* Crutzen and Stoermer, 2000; Crutzen, 2002; Gradstein et al., 2012, p.54). The term Anthropocene refers to a proposed term for a present geological epoch (from the time of the Industrial Revolution onwards), during which humanity has

begun to have significant impact on the environment[2]. Thus, the industrial revolution can be considered as a turning point for the change in the environmental conditions. Before industrialisation the global warming was quite stable, after that period, trend has been increasing significantly. What is important to highlight is that there was a small rise of global warming before industrialisation, but it's not certain that there was an anthropogenic involvement on this; rather, changes were caused by natural reasons. In Figure 1, we can see the trend of global warming before and after Industrial Revolution.

The IPCC defined changes in global mean temperature (GMST) as a weighted average of near-surface air temperature (SAT) variations over land and sea surface temperature (SST) variations over the oceans (Allen *et al.,* 2018, p.56). Nowadays the increased global warming due to human activities is about 1°C but, if the trend will be the same in the future, human activities will lead global temperature at 1.5°C above pre industrial level in the 2040 (Allen *et al.*, 2018, p. 81). In Figure 1, surface and air and sea surface temperature are measured through the thin blue line, while surface air temperature only is indicated with the dashed blue line.

Figure 1. Evolution of global mean surface temperature (GMST) over the period of instrumental observations.



Source: Allen *et al.* (2018) p.57

[2]Anthropocene. In *Dictionary.com,* Retrieved from: https://www.dictionary.com/browse/anthropocene

The most important thing to observe in Figure 1 is the level of impact that generates global warming. First, it is vital to comprehend what does the term impact mean in this context. Consistent with the AR5 (IPCC, 2014b), 'impact' in this report refers to the effects of climate change on human and natural systems (Allen *et al.* 2018, p.68). The two key drivers that affect global mean temperature (GMST) can be called as: human-induced warming and natural-induced warming.

The human-induced warming average level (yellow line) reached 1.04°C Allen *et al.* 2018, p.59). in 2017, this information explains that the impact of human-induced warming after industrialisation is very consistent. The level of human-induced warming is proportionated to the cumulative Co_2 emissions (Allen *et al.* 2018, p.61). Total warming (the orange line) gives a broader estimation of the trend of global warming without considering the reasons associated. In other words, the total warming line contains both the human-induced warming and the natural one. Since 2000 (Allen *et al.* 2018, p.59), the impact of natural factors (such as changes in solar and volcanic activity) hasn't been so relevant, thus, we can conclude that total warming level and human-induced warming are quite similar.

The main risk of the global warming's trend, derives from the fact that it is forecasted, due to human activity, the average global temperature will exceed 1.5°C above pre-industrial level. Imperative actions for the stabilisation of the temperature should be taken; it is obvious that this goal requires not only the involvement of international and national organisations, but also of all the other economic operators, such as companies and individuals. In other terms the report explains that "pathways that stay below the stabilisation level (concentration, forcing, or temperature) during the time horizon of interest (e.g, until 2100)" (IPCC 2018, p.555) are called *non-overshoot pathways*. In chapter 1, IPPC highlighted many scenarios for the stabilisation of the global limit temperature. The key action to undertake regards the reduction of "an atmospheric heating phenomenon, caused by short wave solar radiation being readily transmitted inward through the earth's atmosphere but longer-wavelength heat radiation less readily transmitted outward, owing to its absorption by atmospheric carbon dioxide, water vapor, methane, and other gases; thus, the rising level of carbon

dioxide is viewed with concern."[3] Human activity tends to increase the emission of gases related to the so-called greenhouse. The reduction of the greenhouse effect is a complex issue because all the aspects of the society shall be considered, but one sector is linked to the other. In other words, if one specific sector of the society had increased gas emission, other sectors could be negatively affected.

The practical actions for the restraint of gas emission, should be taken for both supply and demand sides. For instance, the former side regards activities like exploitation of renewable resources, production of healthier food, elimination of coal in the energy area, while the latter side actions could be summarized with a change in each individual lifestyle toward (Rogeli *et al.* 2018, p. 161).

The best pathway, should be the achievement of the *net zero CO2 emission*. The IPPC report defines this goal as the net zero carbon dioxide (CO2) emissions are achieved when anthropogenic CO2 emissions are balanced globally by anthropogenic CO2 removals over a specified period. Net zero CO2 emissions are also referred to as carbon neutrality (IPCC 2018, p.555).

Other pathways could contemplate a temporal excess of the limit temperature, this implies a greater change in the ecosystem.

Thus, net zero CO2 emission will be crucial in the future; otherwise, there will be many natural catastrophic events. Hoegh-Guldberg *et al.*, (2018) in chapter 3 tell us that after industrial revolution, average global warming increased by 1°C due to human activity only. The Earth is warmed differently depending on the different areas. Indeed, the Artic has been increased its temperature especially in winter. Also, continents suffer more from global warming too. Though global average warming is about 1.5°C above pre-industrial level, the temperature in more affected areas is higher.

The global warming effect entails also a significant change in the distribution of flora and fauna (Hoegh-Guldberg *et al.*, 2018 p.282).

In climate policy, mitigation measures are technologies, processes or practices that contribute to mitigation, for example, renewable energy technologies, waste minimisation processes and public transport commuting practices (IPCC 2018, p.554) These *mitigation measures* should be considered as

[3]Greenhouse effect. *In dictionary.com*. Retrieved from: https://www.dictionary.com/browse/greenhouse-effect?s=ts

necessary condition to prevent excessive climate change. However, not only individual behaviour is determinant to contrast global warming, there are three endogenous factors that are important as well. These are: economic environments, cultural and institutional one. Whether a social context has the opportunity to invest, the consciousness to reduce environmental pollution should lead the government to support the improvement and the implementation of low emission technology. Also, the demanded quantity of these new technological products instead of the existing one is crucial. This phenomenon is called *disruptive innovation*. Disruptive innovation is defined as "demand-led technological change that leads to significant system change and is characterized by strong exponential growth" (IPCC 2018, p.547).

Unfortunately, the demand of renewable resources has not been exhausted yet. Since development of renewable resources can discourage global warming, a support from the government should be the only way to promote them. Technically, the government should apply standards, regulations and tax policies suitable with the promotion of renewable resources. It is clear that investing in low emission technology entails an incremental cost. The intervention of the government can help companies and individuals to cope this underpinning.

A social context that aims to limit global warming, should have the possibility under many aspects to do this. Specifically, it should have the economic, institutional, cultural, technological possibility but also the geophysical and environmental one. The geophysical condition refers to the possibility to create a natural context that maintains the global warming stable, for instance by planting new forests or by reforesting an existing one. The environmental condition is relevant too, because physical resources are needed to undertake a conversion from a traditional way to a sustainable one (de Coninck *et al.,* 2018 pp.392-393).

Any action aimed at reducing the emission of CO2 is a process known as *Carbon dioxide removal*. They are: "anthropogenic activities removing CO2 from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products" (IPCC 2018, p.544). There are many ways to remove CO2 emission, indeed, we mentioned the process of foresting (that boosts also biodiversity), or the development of low emission technology and the usage of renewable resources. Another way to do this, is *bioenergy with carbon capture*

and storage, a process that consists of burning plant material, known as biomass, in order to produce bioenergy. It is important to underline that plant material, before being burned, had already absorbed the CO2 in the atmosphere (de Coninck *et al.,* 2018 p.394).

As global warming influences differently in each region of the world, based on its characteristics, consequently each of them responses for the prevention of the temperature in its own way. The type of response is defined as "adaptation", that is the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities (IPCC 2018, p.542).

Adaptation measures have very wide-ranging, for example, preventing tsunamis by building walls and embankments, improve the quality of agricultural production through social learning, enabling any type of financing aimed to protect the environment, etc.

As mentioned by de Coninck *et al,* some societies have already taken some adaptation measures in response to global warming, while others not. The type of adaptation policy is suited to the characteristic of the context by which a set of people live. Sometimes adaptations measures could generate a benefit in the moment that they are implemented, but they can reveal an obstacle in the future. We can observe for instance that to offset the lack of water, you could gather it upstream, but in the future, there won't be enough water downstream (de Coninck *et al.,* 2018 p.396).

The two types of responses to climate change that we have been identified, adaptation and mitigation, should work in line with the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987) and balances social, economic and environmental concerns" (IPCC 2018, P.559) This is what is called *sustainable development*. In this way, sustainable development will be helped through the synergies of the responses due to climate change. Otherwise, if the correlation among adaptation, mitigation and sustainable development results negative, there will be a problem of trade-off between climate change and sustainable development. The less trade off there are, the better is; likewise, synergies allow both limitation of global warming and the achievement of sustainable development goals. Actually, IPPC discovered that mitigation and adaptation are strongly connected with sustainable development. Whereas the actions taken to

reduce global warming improves sustainable development, the opposite is true as well. Indeed, empowering women, results beneficial for the climate, even though apparently there is not any correlation between women empowerment and climate change. It is a matter of synergy: when an action helps sustainable development, it enhances also climate change situation. The problem of trade off can be present for example if there is a conversion from the usage of fossil fuel to the a renewable one: if the change is not planned carefully, it will compromise the role of those who works in the fossil fuel field. In each field of work in which the evolution should be applied, the management of the workers' retraining is vital (Roy *et al.,* 2018 p.477).

All the initiatives that generate synergies are denominated as *Climate-resilient development pathways*. They are "trajectories that strengthen sustainable development and efforts to eradicate poverty and reduce inequalities while promoting fair and cross-scalar adaptation to and resilience in a changing climate" (IPCC 2018, p.546). Through these pathways, it is possible to attain the *Sustainable Development Goals*, that are "the 17 global goals for development for all countries established by the United Nations through a participatory process and elaborated in the 2030 Agenda for Sustainable Development, including ending poverty and hunger; ensuring health and well-being, education, gender equality, clean water and energy, and decent work; building and ensuring resilient and sustainable infrastructure, cities and consumption; reducing inequalities; protecting land and water ecosystems; promoting peace, justice and partnerships; and taking urgent action on climate change" (IPCC 2018, p.559); and obtain zero net emission in about the middle of the century (Roy *et al.,* 2018 p.479).

1.1.2. International initiatives

The issue of climate change has aroused the will to undertake measures to resolve the main problems highlighted in the report that we have mentioned before. Many agreements and conventions are taken at international/global, European and national level.

In 1992, the *United Nations Framework Convention on Climate Change* (UNFCCC) was established in New York. Nowadays, the participation at the

Convention accounts for 197 countries (UNFCCC, 1992). This convention was realised with the goal to reduce the impact of climate change by reducing global warming due to human influences. Since industrial revolution, growth has been taken place principally in the developed countries. Thus, they must be recognized as the most responsible for greenhouse gas emission. This trend stimulated UNFCCC to sign an international agreement: *The Kyoto Protocol*. The maxim of this agreement is: "common but differentiated responsibilities" (UNFCCC, 1997). The agreement, signed in Kyoto, was ratified and approved by 84 countries (UNFCCC, 1997). The members of this agreement should pursue first their national goals, and then help the other members to achieve their targets (UNFCC, 1997).

A more recent UNFCCC treaty was established in the 2015 (December the 12th) with the title of *Paris Agreement*. The main objective of this deal is to encourage the limitation of the worldwide temperature in the long period and enhance even more the techniques to reduce carbon emission. This requires financial flows and the realisation of new technologies suitable with the reduction of gas emission. Both adaptation and mitigation measures are planned. The contribution at national level can be made through personalised mitigation (UNFCCC, 2015) process to reduce gas emission; those results obtained by each member's state of the agreement, currently 185 (UNFCCC, 2015), should be communicated through the nationally determined contributions (United Nations, 2015) "*NCDs*". *NCDs* is the key element of transparency and it represents one of the most important aspect that Paris Agreement' s member should comply with. The most important thing, is that the long-term adaptation course will be appreciated. Last but not least, the Agreement focuses on the creation of public awareness and sensitivity regarding the issue of climate change (UNCC, 2015).

Even though the Paris Agreement is succeeding in the purpose of keeping global average temperature as close as possible to 1.5°C above pre-industrial level, a further step is going to be vital. For the implementation of all the Paris Agreement goals, the involvement of all the leader members in any field (for instance in the politics, finance, business, civil society) is required. For this reason, UN are organising the *Climate Action Summit* which will take place on September the 23th this year (2019). The *UN Secretary-General* declared that:

“the Summit will focus on areas that go to the heart of the problem- the sectors that create the most emission and the areas where building resilience will make the biggest difference” (United Nations, 2019). This means that this Summit examines the parts in which it will be necessary to act in a priority manner, in a such a way that the reduction of gas emission will be relevant and, as consequence, the average global temperature too. The UN Secretary has planned some practical interventions that will be proposed in the Summit in September: one proposal concerns the adoption of private and public sources to support the activity of decarbonisation in those sectors that are more crucial. Moreover, these sectors should increase the timeline to restore their natural stability with the reduction of pollution generated. Another topic regards the advantages generated in terms of efficiency from the transition to renewable energy. So that, traditional source of energy (fossil fuel) will be discouraged in favour of the renewable one. At industrial level, many activities will be fitted with a production that causes less pollution; but gas emission should be decreased also by preserving the natural environment through the promotion of sustainable agriculture and protection of biodiversity. A critical sector that will be discussed in the Summit, concerns also the realisation of low emission buildings, infrastructures and transports. Priority is not only a matter of sectors, but also different countries can be considered more dangerous than others in terms of quantity of pollution created (United Nations, 2019) As we have seen for the *Kyoto Protocol*, in general, the more a country is developed, the more it can be considered dangerous from the pollution point of view.

The decision taken by the UN Secretary to call into question all leaders belonging to each member states represents a strong signal for the implementation and acceleration of the climate change solutions.

As consequence of all these initiatives, some companies have started implementing environmental corporate policies. Corporate environmental strategies are communicated to stakeholders through non-financial reports. The process of disclosing sustainability of the activities and impacts generated by companies is spreading more and more. The new trend concerning the communication of qualitative information in addition to financial one, requires a new type of framework. Currently, this type of disclosure is not yet fully regulated by governmental institutions; only certain categories of companies are obliged to

disclose environmental information. Companies which have starting voluntarily disclosing qualitative information, have to cover the problem of a lack of a specific guideline. Stakeholders require that corporate reports should be disclosed with specific criteria in order to evaluate their reliability.

Through the collaboration and the contribution of important stakeholders, an independent international organisation denominated *Global Reporting Initiatives* was created. This organisation, set up in 1997 and based in Amsterdam, aims to help companies and businesses to communicate and to evaluate results obtained through their corporate sustainable activities. It has created sustainability reporting standards for this purpose. In this way, a process of empowerment of decisions affecting social, environmental and economic issues have been realising. Around 93% of the largest 250 entities in the world adopt GRI sustainability standards. Guidance for the implementation of sustainable strategies are communicated to companies which adhere to GRI. International standards give the benefit to facilitate communication and comprehension between companies and stakeholders (GRI, 2019).

Sustainability Reporting Standards realised by GRI, could be considered as a free public good and GRI helps companies to implement them. GRI's Sustainability Reporting shows the organisation's value and the governance model of a company. Through this type of report, Stakeholder are able to understand company's strategy for its sustainable conducted activity. Thus, environmental, economic, social and governance performance of a company could be measured by stakeholders. GRI Standards include some key elements. Standards are the implemented through the combination of different technical expertise. Thus, they are based on a multi-stakeholder engagement. Another important aspect is that GRI works in collaborations with governments, international organisations and its standards favour the realisation of environmental policies. Standard should be considered as independent due to the creation of the *Global Sustainability Standards Board* in 2014. Finally, GRI reporting guidance costs are shared among many actors such contributors and users. The low cost of Standards discourages the individual, self-development of standards made by companies. In this way, the creation of different standards is avoided and a unique global standardised guideline is promoted (GRI, 2019).

1.2. CARBON EMISSION POLICY

Carbon dioxide is "a colourless, odourless, incombustible gas, CO2, present in the atmosphere and formed during respiration, usually obtained from coal, coke, natural gas by combustion, from carbohydrates by fermentation, by reaction of acid with limestone or other carbonates, or naturally from springs: used extensively in industry as dry ice, or carbon dioxide snow, in carbonated beverages, fire extinguishers, etc".[4] We will focus on the amount of carbon dioxide generated through human activities. Specifically, at corporate level, carbon emission can take place in two forms*: combustion emission and process emission*. The former is the main way by which a company can generate pollution. Due to the exothermic reaction of a fuel with oxygen, combustion emission is the result of burning fossil fuels (Cadez et al., 2015, p.4134) and it is diffused in industries like energy and the manufacturing one. The latter is based on the fact that industries that usually take great quantity of carbon material (such as iron, steel, lime, paper etc) adopt this type of process. The consequence of this, is the release of carbon dioxide (Cadez et al., 2015, p.4134). Since the threat of environmental problems involves not only individuals, but also the other organisations and all companies of the world, the main initiatives taken for the resolution of this problem should be first described. Details about internal management of carbon emission at corporate level, will be discussed in chapter 2.

1.2.1. Carbon footprint

The consciousness of the environmental problem characterized by climate change, is spreading more and more. It's known as well that the emission of carbon is correlated with pollution and, consequently, with climate change. Even though many organisations and entities have been promoting and adopting a climate change strategy to resolve all the main factors that affects negatively climate change, what should be boosted is the climate change mitigation strategy. Climate change mitigation strategy focuses directly on the amount of carbon

[4] *Carbon dioxide, In Dictionary.com:* Available at: https://www.dictionary.com/browse/carbon-dioxide

emission generated by a firm (Cadez et al., 2015, p.4140). So, this type of strategy contains all the actions that a company should do for the limitation of the Co_2 emission (Cadez et al., 2015, p.4132). Before applying any climate change mitigation strategy, it should be recommended to have some carbon emission data to understand better the types of interventions to undertake. Indeed, what is not completely clear for people, companies and governments is the evaluation of the quantity of carbon generated by each of them. Co_2 emissions is considered to be the main culprit of the greenhouse gas emission negative impact (Correa *et al.,* 2018 p.786). This is why the necessity of measuring the amount of carbon emitted in the world is even more urgent.

A methodological process allows any individual, companies or government to get a precise information of the amount of carbon emitted: the *carbon footprint*. It is a calculator aimed at estimating the amount of carbon emission. There are many types of calculators that differs each other in terms of scope and sector involved. Indeed, there are calculators fitted for the estimation of the lifestyle of an individual, or some used for one type of activity only, that is for those linked to the energy sector (Murlow *et al.,* 2018, p.33).

One of the most reliable carbon footprint calculators on the web, is *Carbon footprint Ltd*, based on Hampshire (Carbon Footprint Ltd, 2015). This company has a website calculator for both individual, small and large companies that indicates the level of carbon emission. The ultimate goal, whether it is possible, is the carbon reduction; if it is not possible to decrease it in one specific activity of a company, the focus will be the reduction of the same amount of carbon (that you are not able to afford in that activity), from another activity. This process is known as *Carbon Offset* (Carbon Footprint Ltd, n.d.). It comprehends three steps: the first one is the calculation of carbon emission, the second one is the application of the relative reduction and the last one is the adoption of one of the offsetting projects to compensate the remaining part, (if any), of carbon that is impossible to obliterate (Carbon Footprint Ltd, n.d.). In the case of *Carbon footprint Ltd*, their carbon projects are all characterised by the *Quality Assurance Standard* (QAS), which is a governmental no-profit organisation, and the nature of its scope is "that carbon offset project meet the highest standards available in the offsetting industry and that carbon retirement is done in an open and timely manner" (Carbon Footprint Ltd, 2012).

Generally speaking, a carbon offset project should be conformed with the *QAS Approval Procedures*. They illustrate in detail the requirement related to the:

1) Application Process

2) The Independent Audit Process

3) Criteria for Calculating Emission

4) Criteria for Projects and Credits

5) Criteria for Transparency

6) Subsequent Breaches of QAS-Approval Requirements (Quality Assurance Standard, 2016).

The *Application Process* illustrates the conditions that an organisation, which wants to offer a carbon offset service under QAS, has to comply with. That kind of entity is defined as *Provider*, while if it delegates its task to another company, named *Responsible Provider*, it will obtain the name of *Reseller*.

As far as the *Independent Audit* concerns, it is an organisation selected annually by QAS, which controls the validity of the online carbon footprint calculation made by a provider. After that, any product tested and controlled will be classified in QAS website via specific ranks. Those approved by QAS or which have to be renovated are classified with colour green, those that has not been accepted by QAS yet, are ranked as amber colour; and finally, red colour goes to those that are not considered suitable form QAS. The current role of the Independent Audit is undertaken by *Ricardo-AEA Ltd* (Carbon footprint LTD, 2012).

Even though an individual or company is not willing to offset the overall part of carbon emission (e.g. the entire lifestyle or all of the business sectors), it is considered eligible for the QAS' "Criteria for Calculating Emission". The methodologies for calculation acknowledged by QAS are:

- The WRI Greenhouse Gas Protocol;
- National methodologies such as DEFRA's Voluntary Reporting Guidelines and those used by the US EPA & the NZ Ministry for the Environment;
- Methodologies produced by respected independent organisations such as ISO, IEA, IPCC & the EU (Quality Assurance Standard, 2019).

Whether it is possible, QAS considers more dependable the usage of sets of data that are taken directly from the reality, rather than modelled methods like those we mentioned before.

Not only carbon offsets projects should be conformed with QAS, but also the carbon credit. Carbon credit is "a permit that gives a company, country, etc., the right to emit a specified amount of carbon compounds in the atmosphere, and may be purchased if emissions are expected to exceed a quota or sold if the quota is not reached. Companies can accumulate carbon credits by funding new forest growth"[5]. QAS impose the conditions so that a carbon offset project got good carbon credits. The most important carbon offsets projects approved by QAS for Carbon footprint Ltd are: The "Certified Emission Reductions" and the "Verified Carbon Standard" (Carbon footprint Ltd, 2012).

Providers and Resellers that offer carbon offset project certified by QAS must communicate to appliers their adopted methodologies. This constraint is established through the *Quality Mark License Agreement*, which is signed between Providers/Resellers and QAS.

If a Provider should infringe QAS rules for any reason, it will be urged to correct its methodology in line with QAS principles in 10 working days. Otherwise, the Quality Mark Agreement will be abolished (Quality Assurance Standard, 2019).

Carbon footprint Ltd has the approval by the QAS for all its carbon project offsets and for all its online calculators. An exception is when it verifies an uncertainty after one estimation, the second footprint will not be considered in line with QAS criteria (Carbon footprint, 2016).

Carbon footprint calculation has been always a topic of discussion among experts; many doubts emerged, for instance regarding the type of input that could be evaluated, or the risk that a specific input could be calculated twice. In 2008, it was observed that the carbon footprint calculation has some limitation for the precise measurement of both direct and indirect carbon emission and that other types of gases emitted are not calculated. (Correa *et al.,* 2018, p.789). Years by years, the methodologies for the carbon footprint evaluation have been increasing even more. Some authors declared that the lack of the estimation of the other

[5] *Carbon Credit,* in Dictionary.com, retrieved from: https://www.dictionary.com/browse/carbon-credit?s=ts

greenhouse gases was solved by considering them as an input in terms of equivalent carbon (Correa *et al.,* 2018, p.789). Practically, the other gases are considered for instance when we consider the carbon emission in the entire product life cycle. To do that, it is mandatory to have a clear idea of all the steps of a product's life cycle. In this way, the detection of all the related potential activities that generate gas emission is possible and the risk of double calculation is excluded (Correa *et al.,* 2018, p.789).

In conclusion, carbon footprint calculators represent a useful tool for any economic agent that is willing to understand as much as possible the quantity of pollution that it is going to generate.

1.2.2. Carbon disclosure

Mitigation strategies aimed at reducing carbon emission should be promoted worldwide, in such a way to be able to make everyone's eyes open about this issue. Among the others, there is an organisation that stands out for the positive impact generated on global scale for the disclosure of the problematics related to carbon emission. This is *Carbon Disclosure Project* (CDP).

It is an international organisation that wants to give its contribution to develop a sustainable economy in the world. Specifically, it is not-for-profit charity that runs the global disclosure system for investors, companies, cities, states and regions to manage their environmental impacts. The headquarters of this organisation is located in London; it's managing Director operates in Berlin, while the other main offices are situated around the world including New York, Hong Kong, Tokyo etc. (CDP, 2019) It provides for individual, companies, cities, region and governments some guidelines to protect the environment (CDP, 2019). The existence of this project has been creating awareness around the world about the dangerousness of climate change. It plays an active role in solving environmental problems by offering its contribution. The first step of its activity, consists on the collection of environmental data by proposing a questionnaire to any individual or entity that is sensitive to the environmental problem. Companies that decide to join with the CDP can benefit from many advantages: they are subjected to some programs that permits them to show a clearer situation of their business and to attract new investors (CDP, 2019).

CDP applies a *climate change program* to quantify the impact that a company has on the environment. In this way, the company can be addressed to reduce environmental risks. Nowadays, CDP reveals that in the world 31 gigatonnes (Gt) of greenhouse gas emission are produced yearly but the good news is that the overall low-carbon goods and services worth 5.5 tn (CDP, 2019). Another program that CDP offers to companies is the Forests one. The phenomenon of deforestation represents a serious threat for the planet; indeed, it accounts for about 10-15% of the entire gas emission. For companies, the topic of deforestation affects negatively their supply chain, indeed, CDP estimates that the impairment of supply-chain drops the share price of a company by about 7% (CDP, 2019).

Another reason of disclosure, stands in the CDP water program: water supply represents the most relevant risk for human beings. In this case, CDP helps companies to reduce the waste of water and to find out partnerships that promote water security (CDP, 2019). Carbon disclosure project is a voluntary initiative and it constitutes a potential document a company could have in its corporate reporting. The way through which CDP gathers data from companies (and cities) is the following one: companies are submitted to a questionnaire suitable for each of the above-mentioned programs (Ministero dell'Ambiente e della tutela del Territorio e del Mare, 2019). CDP's project involves costs which vary depending on companies' assets. For instance, companies with less than 1 billion of assets, should pay 975 as annual fee. While, for assets higher than 1 billion, the annual fee will be 1475 dollars (CDP, 2019). Based on the environmental information obtained by CDP from companies, CDP implements a rank to clarify the degree of their environmental contribution. The rank consists on the classification of companies in four sections: A, B, C, D. Nowadays only 2% of the companies are in the top category A. The overall number of disclosed companies are 6.800 (CDP, 2019). The number of entities that have been disclosing with CDP, has increased of 55% since 2013 (CDP, 2019). Despite the fact that only a little percentage of companies are ranked in A section, the increasing number of disclosing companies still represent a good signal from an environmental perspective.

Currently, about 115 purchasing organisations and 11.500 suppliers cooperate with CDP in the detection and supervision of the mentioned programs (CDP, 2019).

Further investors are inclined to select those companies that have published their environmental data through CDP. The main advantage for them relies to the fact that they can reduce the risks associated with the company's environmental problem. The number of investors that have consulted the CDP platform are over 525, in terms of assets invested the amount accounts for 96 trillion all over the world (CDP, 2019). Companies that have adhered to CDP programs, are also able to take the advantage of attracting new customers, because of the increasing demand of eco-friendly firms.

CDP collects data also for those cities that are willing to contribute with this project. The free utilisation of CDP platform helps cities to understand better the pitfalls of climate change and it is able to guide them to mitigate. The result is that, nowadays, over 600 million people living in cities active in this field, have the possibility to have a better lifestyle (CDP, 2019).

CDP has gathered data related to climate change of over 620 cities and 120 regions and states and any economic agent is able to take advantage from them (CDP, 2019). Then it has been realising many reports suited for governments, regions, cities, companies and citizens. Many organisations that have joined CDP programs, have given their own advice in solving specific environmental problems in any context. In this way CDP has always been publishing those solution with the intention of helping the other members (CDP, 2019).

CDP appeals to the Paris Agreement goals. In summary it gives its contribution to lower the average temperature as much as possible via its initiatives of sensitisation (CDP, 2019).

The relevance and the dimension of this Project is clearly explained by the UN Secretary General: Ban Ki-moon. He declared: "The work of CDP is crucial to the success of global business in the 21st century [...] helping persuade companies throughout the world to measure, manage, disclose and ultimately reduce their greenhouse gas emission. No other organisation is gathering this type of corporate climate change data and providing it to the marketplace" (CDP, 2019).

1.3. THE INTERVENTION OF PUBLIC ADMINISTRATION TOWARD COMPANIES

The positive consequence of the environmental initiatives adopted by the most diverse organisations is the launch of an environmental regulation process. Due to the growing mindfulness of environmental issues, many governmental institutions have begun to take concrete actions to limit companies' pollution.

1.3.1. The European Environmental Policy

European Union (EU) raises the primary objective of protecting the political, economic and social rights of all the Member States. EU was established in 1957 to enhance the quality of life of all the European citizens (European Union, 1957). The economic and cultural relations among European citizens have been favoured thanks to the EU's policies. As stated in Article 11 of the *Treaty on the Functioning of the European Union* (TFEU), Environmental protection must be integrated into the definition and implementation of the Union's policies and activities, in particular with a view to promoting sustainable development (European Union, 2012, p. C 326/53). Sustainable development necessarily requires environmental protection. To confirm this, there will not be a sustainable economy if it causes high level of pollution Since EU acts in any field to improve the quality of life of each member State, environmental interventions too are not excluded.

The European environmental policy has as its main goals those described in the *Treaty on European Union* (TEU) article 3 (3) declares*: The Union shall establish an internal market. It shall work for the sustainable development of Europe based on balanced economic growth and price stability [...] and improvement of the quality of the environment. It shall promote scientific and technological advance* (Europa.eu, 2012, p. C 326/17). As we have seen, in some international initiatives and reports it is highlighted the urgency to promote low emission technologies in order to limit environmental problems; that's why the EU has the intention to boost the transition from old, existing technologies to new and eco-friendly ones.

Once established the generic EU's targets, the way through which it operates for the achievement of these goals must be explained. In the TFEU, there are the environmental principles on which EU rests. As from the article 191 (2): *Union policy on the environment shall aim at a high level of protection taking into account the diversity of situations in the various regions of the Union. It shall be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay* (European Union, 2012, p. C 326/132). In the more recent IPCC report, *Global warming of 1.5°C*, we have seen that the consequences of pollution differ region by region; so, measures should be tailored. Indeed, when EU adopted the Kyoto Protocol in 1997, those European countries that have adhered, had a specific, individual target to reach (European Commission, 1997). The precautionary principle relies the fact that probable environmental damage means that all the society could be harmed; the actions taken to avoid any damage are guided by scientific studies such as the report mentioned above.

At European level, the implementation of the environmental policy requires the involvement of some of its ancillary bodies. One of them playing a key role in this field, is *European Commission. It promotes the general interest of the EU by proposing and enforcing legislation as well as by implementing policies and the EU budget* (European Union, 1958). European Union has been participating to many environmental agreements especially those promoted by the United Nations; for instance, it takes part at the *High Level Political Forum on Sustainable Development, UN Environment Assembly* (European Union, 2017). According to the treaties that EU has ratified, it should further sustainable development not only in the environmental context, but also in the economic and social one. The realisation of all these premises, is up to the European Commission and its mission is explained in the article 17 of TEU: *The Commission shall promote the general interest of the Union and take appropriate initiatives to that end. It shall ensure the application of the Treaties, and of measures adopted by the institutions pursuant to them* (Europa.eu, 2012, p. C. 326/25). In article 17 (2) it is specified the exclusivity of European Commission in playing this role: *Union legislative acts may only be adopted on the basis of a Commission proposal, except where the Treaties provide otherwise*

(Europa.eu, 2012, p. C 326/25). Although the European Commission has the main role in the implementation of policies, also the interaction with other auxiliary bodies should be taken into account. Back to the previous article, the interaction of the European Commission with the *Court of Justice* is pointed. Article 17 of TEU says: *it shall oversee the application of Union law under the control of the Court of Justice of the European Union* (Europa.eu, 2012, p. C 326/25). As mentioned in the article 191 (2) of TFUE, the EU must sanction those European countries that pollutes; in practice, these situations are managed by the European Commission and the Court of Justice. Article 258 of TFEU declares: *if the Commission considers that a Member State has failed to fulfil an obligation under the Treaties, it shall deliver a reasoned opinion on the matter after giving the State concerned the opportunity to submit its observations.* If the State concerned does not comply with the opinion within the period laid down by the Commission, the latter bring the matter before the Court of Justice of the European Union (European Union, 2012, p. C 326/161). While European Commission has the task of making the environmental policies (actually policies in general) implemented by the Member States, it is up to the European Court to evaluate whether they have correctly adhered to these policies or not. Before ruling this, the European Courts allow the Member State that has broken the rule and to remedy it: article 260 (1) of TFUE explains that if the Court of Justice of the European Union finds that a Member State has failed to fulfil an obligation under the Treaties, the State shall be required to take necessary measures to comply with the judgment of the Court(European Union, 2012, p. C 326/161). In this phase, the Member State has the possibility to repair its mistakes by following Court's instruction. If it does not happen, the Court will intervene. If the Court finds that the Member State concerned has not complied with its judgment it may impose a lump sum or penalty payment on it (Europa.eu, 2012, p. C 326/161).

Once defined the goals and principles of the environmental laws, and after analysing the sanctioning procedures for any violations of these rules, we focus on the type of interventions assumed by the EU. These types of action are taken by the *Council*, which defines the priorities (European Union, 1992) of the EU, and cooperates with the *European Parliament* which in turn should supervise (European Union, 1979) Council's activity. The Council acting unanimously in

accordance with a special legislative procedure after consulting the European Parliament shall adopt:

(a) Provisions primarily of a fiscal nature

(b) Measures affecting:

- town and country planning,
- quantitative management of water resources or affecting, [...] the availability of those resources,
- land use, with the exception of waste management;

(c) measures significantly affecting a Member State's choice between different energy sources and the general structure of its energy supply. (Article 192 (2)) (Europa.eu, 2012, p. C 326/133)

Environmental taxes aim at discouraging any environmental impacting activity; energy and transport sectors are subject to these taxes, also any activity or resource that potentially generates pollution too (European Commission, 2011). The other measures are all in line with the latest reports published on climate change; to confirm this, the EU is also involved in the implementation of the Paris Agreement (European Union, n.d.)

As far as the environmental context concerns, the EU claims the best standards in the world, it has always been sensitive to the lifestyle of its citizens and for the preservation of the natural resources (European Union, n.d.)

The recipients of the measures in Article 192 (2), are the European Member State, but many of them are indirectly addressing these measures to companies established within borders.

1.3.2. The National Environmental Policy

Italy, as a European Member State, has been fully adhering to any European initiative in the environmental context. But this does not mean that it could not have a certain degree of autonomy and freedom in this field.

The protective measures adopted pursuant to Article 192 shall not prevent any Member State from maintaining or introducing more stringent protective measures. Such measures must be compatible with the Treaties. They shall be notified to the Commission (European Union, 2012, p. C 326/134). Although at European level the incidence of the environmental policy is uppermost related to

the national one, in the latter there is anyway the possibility of integrating additional customized rules.

The Italian's primary sources of law mentions indirectly the protection and safeguard of the environment. Indeed, Article 9 of the Constitution states*: it shall safeguard natural landscape and the historical and artistic heritage of the Nation* (senato.it-La Costituzione, 2018, p.8). The implicit assumption of this sentence is that the environmental philosophy of UE is in line with the Italian Constitution. Environmental issues involve the interest of the entire society, as mentioned in article 32 of the Constitution: *The Republic shall safeguard health as a fundamental right of the individual and as a collective interest* (senato.it-La Costituzione, 2018, pp. 16-17).

The Italian Ministry of the Environment, is the institution in charge of implementing environmental policies. It deals with the protection of natural biodiversity including the overall territory within the Italian borders. It promotes climate change and sustainable development policies and incentives good environmental initiatives (Ministero dell'Ambiente e della Tutela del Territorio e del Mare, 2018)

According to the Italian Prime Minister decree 2 paragraph 6 implemented in 2008, the Ministry of Environment delegates the activity of the environmental control to the *Istituto Superiore per la Protezione e la Ricerca Ambientale* (ISPRA) (Ministero dell'Ambiente e della Tutela del Territorio e del Mare, 2019). Thus, ISPRA acts on its behalf.

In 2011, the Ministry of Environment started to involve Italian companies with the introduction of the: *Italian Environmental Footprint Program*. In line with the European *Product Environmental Footprint*, the Ministry of Environment encouraged the willingness of Italian companies to submit to the carbon measurement; in this way, Italian companies that have measured their carbon footprint, are able to improve their carbon management aiming at carbon reduction. As mentioned by the Italian Ministry of Environment, this program gives the opportunity to change companies' supply chain management and to stimulate business choices that are oriented toward a sustainable development Currently, more than 200 entities from companies to universities are involved in this program (Ministero dell'Ambiente e della Tutela del Territorio e del Mare, 2011).

At regional level, the Ministry of the Environment established an environmental plan where regional structures are settled to spread information, instructions and education. This plan is known as *Informazione Educazione Ambientale* (INFEA); any regional administrator is able to interact with those structures to take information and make some proposal about the topic of the environment. This type of program, financed by the Ministry of the Environment, allows Regions a greater political weight in directing individual and companies toward actions in line with those promoted by INFEA (Ministero dell'Ambiente e della Tutela del Territorio e del Mare, 2015).

CHAPTER 2

CORPORATE CARBON STRATEGY FRAMEWORK

2.1. OVERVIEW OF A NOVEL FRAMEWORK

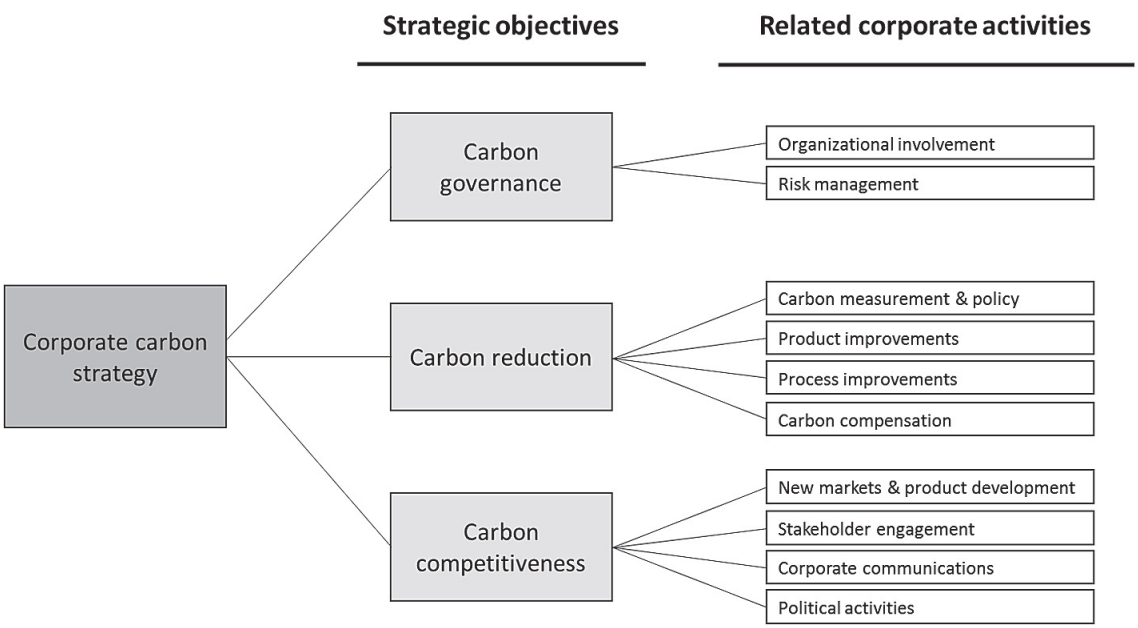
According to the most important climate change reports such as those published by IPPC and considering any future environmental target imposed by authoritative agreements like the Paris one, companies play a central role in the process of pollution mitigation. From 1854 to 2010, almost two thirds of total global GHG emission is generated by only 90 firms (Damert *et al.,* 2017 p.123). The incidence of pollution caused by firms, is far greater than those produced by other organisations and individuals. Over time, companies are becoming increasingly aware of their crucial relevance in terms of environmental impact. Many companies are responding to the threat of climate change trying to reduce, as much as possible, the level of pollution caused by their activities. At the same time, conducting a sustainable business requires an appropriate conversion of endogenous factors like economy, institutions and technology towards an ecological way. These factors should lead companies to adopt, in an easier way, appropriate measures that preserves nature. From a corporate perspective limiting greenhouse gas emission, in an efficient manner, entails a complex series of actions. Many obstacles should a company cope in conducting a sustainable production, given its intrinsic nature that consists in the realisation of profit in the short run. It is vital to understand whether businesses are able to accommodate the long-term strategic perspectives related to climate change within their short-term goal of profit maximization (Damert *et al.,* 2017 p.123). Apparently, the fact that a company undertakes concrete actions to improve its environmental performance creates some disadvantages, especially from an economic point of view. The central topic of my thesis is to investigate whether and how these overlapping goals are actually able or not to give value added to a company. It is clear that a company could eventually benefit from a sustainable activity only if it adapts its internal corporate organisation as a whole. Thus, mitigating pollution for a company it is not only a matter of external factors, like

institutional pressure, but it is also vital to change the internal drivers of a company. To do that, a company should accomplish a cogent plan to make environmental and economic goals coexist.

As we have highlighted in the chapter on carbon emission policy, the main pollutant element among greenhouse gases is carbon. Therefore, we will analyse the ***corporate carbon strategy*** in deep to understand its dynamics and to evaluate the performance of a company according to the industry it belongs. Corporate carbon strategy is a complex set of actions to reduce the impact of a firm's business activities on climate change and to gain competitive advantages over time (Damert *et al.,* 2017 p.124).

The main pillars on which corporate carbon strategies rely are ***carbon governance, carbon reduction*** and ***carbon competitiveness.***

Figure 2. **"Corporate carbon strategy framework"**



Source: Damert *et al.*, (2017) p.125.

To each of these strategic objectives correspond some suited corporate activities. For instance, carbon governance is linked with the organisational involvement and the risk management of a company; at the same time, carbon reduction entails carbon measurement and policy, product and process improvements and carbon compensation. Last but not least, carbon competitiveness can be realised by strengthening new markets, stakeholder engagement, corporate

communications and political activities (Damert *et al.,* 2017, p. 125). Any of those activities associated with the respective objectives, are all assumed to be useful for the realisation of such activities. Relying on Damert *et al.* (2017), we briefly observe the dynamics of the three objectives and the ten activities proposed in their framework.

Despite the relevance of already published studies on climate change, researches about GHG emission and their impact on corporate carbon performance are not abundant (Damert *et al.,* 2017 p.123). Prior studies made for the investigations of corporate carbon strategies' determinants and outcomes present still gaps. Such determinants that generate outcomes in terms of corporate carbon strategy performance are both internal and external. The external ones are identified in the stakeholders, the influence of institutional pressure and the implementation of voluntary environmental disclosures. Environmental norms jointly with the influence of stakeholders in this field, ensure firms to undertake action for the mitigation of carbon emission within their own activities. According to recent researches, the pressure of formal and strict environmental rules over companies, boosts also the influence of non-governmental organisations and investors for carbon reduction. As consequence, companies' reputation in environmental context has accomplished more relevance. To improve their reputation, firms are encouraged to communicate their contribution for the realisation of climate change mitigation (Damert *et al.,* 2017 p.126).

For the practical realisation of carbon reduction, also determinants that are internal to the company are contemplated. The main internal drivers analysed by recent studies regard organisational resources. In particular factors like leadership, employee awareness, organisational learning capacities. All of these internal factors are considered to be a value added for the carbon governance. Action undertaken for the reduction of carbon emission are supposed to enhance carbon and firm performance of a company in the long run (Damert *et al.,* 2017 p.127).

Damert *et al* analyse corporate carbon strategies to verify the role of the briefly mentioned determinants in the process of corporate carbon reduction. The methodology adopted by Damert *et al* to investigate the interactions of corporate strategies and their determinants and outcome, is the *structural equation model.*

The object of observation was composed by 45 leading companies in sectors like cement, steel and automotive one. SEM requires the usage of secondary data to identify the correlation among variables that could not be evaluated directly. Specifically, through a linear regression and other statistical tools, Damert *et al* have tried to identify the relationship among corporate carbon strategies' determinants. Data of the study are thus "gathered from their voluntarily disclosed information" (Damert *et al.,* 2017 p.127).

The investigation procedure is divided in 4 steps. The first one concerns the selection of sectors that are characterised by their particular attention toward environment. The above-mentioned sectors provide this requirement. Next phase regards the selection of companies with the highest market share. Analysing the biggest companies finds its justification in the fact that it is more probable to obtain environmental data. The third step has been the reportage of data through documents such as *Global Reporting Initiative* or CDP. Since the main scope of the Damert *et al.* investigation consists of the evaluation of long-term corporate performance, data were gathered in an interval of 5 years: from 2008 to 2013. The last phase of investigation related to the classification of data collected. Data were distinguished in categories like: information of corporate strategies, GHG emissions, energy and fuel consumption and financial indexes (Damert *et al.,* 2017 pp.127-128).

The main assumption of Damert *et al.* (2017) concerns that all the internal and external determinants generate good outcomes in terms of carbon mitigation. Unfortunately, findings obtained with this type of approach have found some limitations. Results aroused from the investigation had not complied with the expectations of the established assumptions.

The main problem relies on the fact that this type of examination was applied only to companies that voluntarily disclose their environmental data. Due to the limited number of companies that have started to gather and spread those types of data, there are not enough companies for an accurate scientific analysis. Despite the reliability of the CDP reports, nowadays few companies disclose in some way environmental information; thus, there are not sufficient elements for a comparison with companies of other sectors. Since SEM methodology is characterised by the usage of secondary data, many small companies have not sufficient elements to be evaluated in terms of environmental performance yet.

In particular many variables of the corporate strategy, such as carbon governance and carbon pressure, are so far difficult to measure. Results tell us that there is no relationship between carbon performance and financial performance in the long run (Damert *et al.,* 2017 pp. 133-134). No correlation between carbon governance and action taken for carbon reduction have been founded yet. (Damert *et al.,* 2017 p. 132).

Damert *et al* (2017) study have shown that a quantitative analysis of carbon corporate strategies is not able to attain reliable outcomes that permits to assess them and to express an opinion on their performance. Quantitative investigation has an underpinning which is central for this research. Indeed, even though data are analysed precisely, there is the lack of information concerning the reason why such data are achieved. Probably, correlation among variables could not be found because there is not enough descriptive information to give a right interpretation.

For this reason, the current thesis aims at investigating the corporate carbon strategy through the adoption of a qualitative approach. We have already seen in chapter 1 that institutions have put pressure on companies to convince them to reduce carbon emission. The next phase will concern companies' organisational skills aimed at achieving such environmental outcomes imposed or suggested by institutions.

To answer at the research question "How do companies apply carbon strategy?" we rely on the recent theoretical framework proposed by Damert *et al* (2017) to interpret our findings.

Even if the basic assumptions concerning corporate carbon strategies' determinants and outcomes are the same of the previous study, the methodology adopted will be the one outlined in the chapter 3.

After giving a general overview of the corporate carbon strategy, we will now describe study in deep the literature of each strategic objectives and the related corporate activities.

2.2. CARBON GOVERNANCE

To understand the way through which carbon emission should be managed within a company, it is important first to analyse how human beings should

interact with any element or resource that could potentially cause harm to the environment. Therefore, before focusing on a corporate point of view, it is necessary to deepen this issue from a broader perspective. Indeed, human' social structure is very complex, just as dynamics of natural resources.

In the book *Social Networks and Natural Resource Management* (2011) the authors Bodin and Prell claim "the very notion of natural resources, does not only include single extractable resources such as fish, timber and minerals; instead natural resources are also perceived in the much broader context of biophysical processes and ecosystem services" (Bodin and Prell, 2011 p.3). Thus, the meaning of natural resources is not only related to their static and physical nature, but refers also to the effects on the environment generated by their combinations. The term *ecosystem services* refer to the important benefits for human beings that arise from healthily functioning of oxygen, soil genesis, and water detoxification.[6] Forests, oceans and other natural factors have always been giving many benefits to human beings. These benefits have been compromised by the interaction of individual with the management of natural resources. Thus, it is important to analyse the relationship among humans and natural resources, in other words to comprehend the features of ecosystem. Ecosystem is defined as: a system involving the interactions between a community of living organisms in a particular area and its non-living environment.[7] Actually, the main problem is that the complexity of the biophysical environment prevents humans to predict immediately its trend. Generally speaking, ecosystem is a dynamic process that has its own characteristics and changes over time. Considering only one part of the ecosystem, those of human beings, we know they live not only according to the rules imposed by the nature, but also in line with those made on their own. There are many formal rules affecting social relationships, for instance: any community of people is separated by legal borders in the form of nations, cities, provinces and so on. Institutions and other factors like natural resources exploitation, do not get along with the intrinsic nature of natural resources (Bodin and Prell, 2011 p.6). A standard, formalised system is not enough able to manage in a sustainable way the complexity of elements and phenomenon such as natural

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[6] Ecosystem services, *in Dictionary.com,* retrieved from : https://www.dictionary.com/browse/ecosystem-services?s=ts
[7] Ecosystem, *in Dictionary.com,* retrieved from: https://www.dictionary.com/browse/ecosystem?s=t

resources. The relationship that human beings should have towards natural resources must be different. Substantially, it is necessary to change the approach: resources should not be managed or governed, instead a process of governance of natural resources should be applied.

The term governance implies a managing process that is less formalized, more difficult to control, and it is characterized by the interaction of different type of individuals (Bodin and Prell, 2011 p.6).

The limit of the government approach, relies on the fact that only one actor is in charge to manage natural resources; the negative result is that resources are treated for their biophysical aspect only and not for its whole function, facilitating phenomenon like exploitation. Actually, the interaction among human beings and natural resources is not characterized by the relationship between only one individual and natural resources. On the contrary, many actors interact with them. In this way, knowledge and experience from many actors can be expressed in managing natural resources. Following decision made about this topic are not unilateral, but they should be based on collaboration, discussion and coordination among individuals (Bodin and Prell, 2011 p.6).

In 1999, Bunge distinguished an individual approach from a holism one as: the former puts less importance on the social restrictions on agency and tries to analyse and account for social facts through a bottom-line approach. The latter assumes a top-down line to analysis and account for social facts, putting less weight on individual interests and their initiatives. (Bodin and Prell, 2011 p.8).

Since both ways are considered to be needed for an appropriate interaction with natural resources, it should be useful to identify a solution that makes them coexist. The requirement for the coexistence of both methods is that a referent should be neither rational self-interested, nor organic wholes. Instead, they should be related individuals who collectively generate the new suited conditions, above all, social structure (Bodin and Prell, 2011 p.8). This feature represents the key element for the *social relational approach*. Principles of the social relational approach can be applied in different social contexts. According to the focus of the thesis, the analysis of such approach is implemented from a corporate perspective.

Within a company, governance represents a suitable mechanism that aims at reducing greenhouse gasses, especially carbon ones.

Carbon governance is represented by organisation's managerial capabilities of dealing with risks and opportunities associated to climate change mitigation and to the resulting governance mechanisms (Damert *et al.,* 2017 p.125). Therefore, according to the definition, carbon governance is linked with risk management and organisational involvement. An examination of the dynamics of these two activities correlated with carbon governance is made in the following paragraphs.

2.2.1. Organisational Involvement

For a better comprehension of organisational dynamics, we will define some basic notions about the key elements that constitute an organisation. With the support of the literature, we then describe how an organisation responds to climate change's implications.

Within a company, carbon governance performance strongly depends on the resources on which a company may rely to its business. Organisational resources that affect corporate carbon strategies are: employee awareness, organisational learning capacities and strong leadership (Damert *et al.,* 2017 p.127).

We know from Carmeli (2007), that *organisational learning* represents a complex process where two issues have been emerged. The first one concerns learning behaviours within an organisation, while the second one refers to the process of learning from failures. It is argued that individual organisations can learn differently from individuals. Indeed, it is suggested that organisational learning behaviours is different across work units within the same organisation. (Carmeli, 2007 p. 31).

According to Carmeli (2007), social capital represents the key element of psychological safety (Carmeli, 2007 p. 41). When we talk about social capital, we refer essentially to the quality of relationship among actors. Within organisation, and specifically within work units, it was discovered that when members work well together to reach goals, there will be a high degree of learning from mistakes. Good relationships allow communication and detection of errors (Carmeli, 2007 p. 41).

Regarding employees' involvement we rely on the concept of *employee business awareness*. It refers to the fact that any worker of the organisation has the consciousness of firm's strategic goals. Recent studies have shown that boosting employee business awareness helps reducing costs and improving competitiveness. (Haines et al., 2012 p.74).

Spreading awareness within the company, entails that all members of each organisational level are able to give their contribution in solving problems and participating in decision making. This process leads to an improvement of organisational performance (Haines et al., 2012 p.75).

Employee business awareness represents an internal resource that can generate competitive advantage for a company (Haines et al., 2012 p.85). For the resolution of environmental issues, employees' behaviour and actions could have a significant impact in the mitigation of such problems.

According to the literature, there are some debates regarding differences and similarities of figures like leadership and management. It is argued that, within an organisation they provide the same set of activities and functions. At the same time, it is possible that some leaders, for instance informal ones, could not be considered as managers. Usually, leaders are suited for coping with change while the managers are more fitted for the resolution of complex situations. The former figure should be able to communicate and align members of an organisation toward a new vision; it promotes also empowerment (Lunenburg, 2011 p.1).

On the contrary, managers aim to reduce uncertainty through actions like planning, budgeting, organising, controlling and problem solving (Lunenburg, 2011 p.2). Based on these characteristics, both roles are considered to be relevant for the resolution of environmental issue. Since environmental problems are factors that generate uncertainty and requires company's adaptation, the presence of leadership within an organisation is crucial.

Organisational involvement is oriented toward the engagement of company's workforce for climate change mitigation. There are some practical initiatives that a firm can apply for the implementation of climate change mitigation. A company culture based on eco-friendly behaviour could be an optimal solution; at the same time, the provision of incentives for the environmental outcomes obtained are important too. Finally, engaging new

employees specialised in the environmental field could fruitful for the achievement of future environmental targets. (Damert et al., 2017 p.125).

2.2.2. Risk Management

Based on the Committee of Sponsoring Organisations of the treadway Commission's Enterprise Risk Management, risk is the possibility that events will occur and affect the achievement of strategy and business objectives (COSO, 2018 p.1).

Before focusing on risks from a corporate perspective, it is vital to have a broader dimension of their dynamics. International organisations, governments companies and individuals are subject to risks of various nature. The most common risks identified are: economic, environmental, geopolitical societal and technological. According to the *Global Risks Report 2019,* environmental risks represent the major risk on a global scale. In 2019, three types of environmental risks are among the top five. In terms of likelihood, the main environmental risks concern the *extreme weather*. In second position we found a risk related to environmental too: *failure of climate-change mitigation*. Despite the continuous political pressure adopted by international organisations and governments, an eventual failure is still ranked as a high risk. In the third row, *climate inaction* represents an important risk due to the worsening trend of biodiversity. This damage entails risks in terms of health, socioeconomic development and regional security. As far as the global risks in terms of impact concerns, failure of climate-change mitigation and adaptation is creating negative consequences so much to be considered the second global risk in terms of impact. Hardships generated by extreme whether events are considered to be the third main risk. At the end, the fifth risk regards natural diseases (World Economic Forum, 2019 p.12).

Firms are called to cope various typologies of risks, mainly environmental, which in turn can vary their impact and likelihood over time. In addition to this, risks affect companies in different way according to the sector in which they operate and based on the type of activity they do.

Consequences arising from risks could be both positive and negative, especially within a company. A firm could suffer from reduction in term of profit

or it could be damaged from reputation due to the various typologies of risk in which it incurs.

At the same time, action taken to prevent and mitigate potential risk could lead to so the achievement of some benefits like cost savings and discovering new markets. (COSO., 2018 p.1).

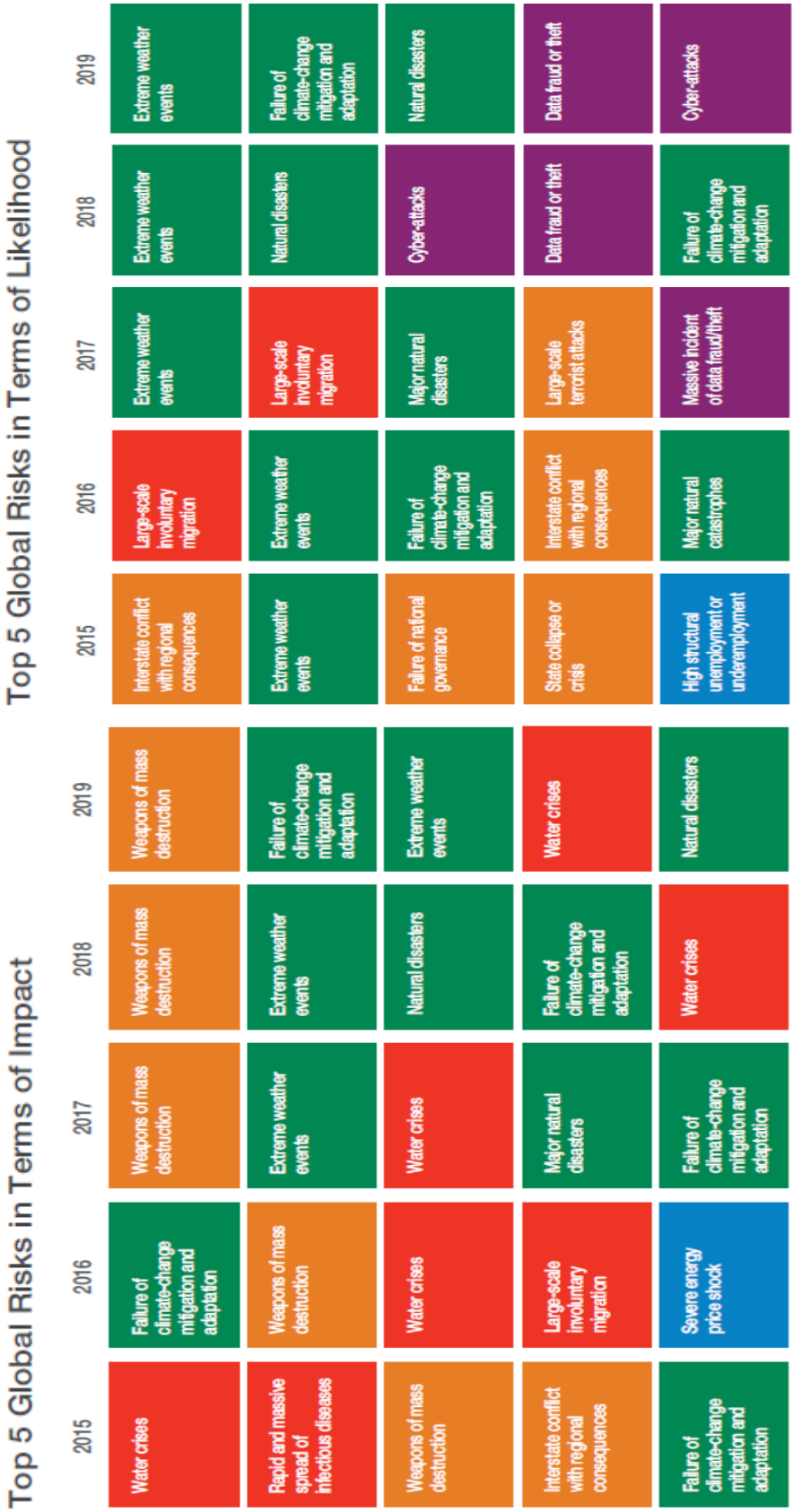
Not only environmental risks are becoming even more alarming for companies, indeed, the ones that are becoming even more relevant in the recent years are *environmental, social and governance* risks (COSO., 2018 p.2).

A framework for the response of ESG risks is proposed by COSO. The COSO ERM Framework describes *Enterprise Risk Management* as the "culture, capabilities and practices, integrated with strategy-setting and performance, that organisations rely on to manage risk in creating, preserving and realizing value" (COSO., 2018 p.5). This guidance is divided in 5 parts. The first one concerns governance and culture for ESG risks.

We have already seen governance's dynamics of a company based on a culture that influence the way through which it acts for the prevention of risks. Next phase regards the strategy and objective-setting concerns the analysis of the ESG risks' impacts and dependencies in the short and long run over ERM activities. (COSO., 2018 p.9). Third step is related to ESG risks' performance It means that risks should firstly be identified (through various tools like SWOT analysis). After that they should be assessed and prioritized and then the quality of a company's response to them determines the level of value created or protected. Fourth element of this guidance is the review and revision of such risks in order to improve the performance exhibited in response to risks. Final step will be the information, communication and reporting for ESG risks: external stakeholder should be informed about the typology of risks involved in a company and the method applied to cope them (COSO., 2018 p.9).

Nowadays, many companies are subject to investor, supplier and customer demand a transparent communication of ESG issues. In particular, information about supply chain characteristic of a company, its board composition and its process of adaptation adopted are strongly demanded (COSO., 2018 p.4).The process of disclosure of ESG information to stakeholders is spreading more and more For instance, 85% of the S&P companies realised an ESG disclosure document in 2018 (COSO., 2018 p.4).

Figure 3. The 2019 Global Risks



Source: World Economic Forum (2019). Global Risks Report p.12.

2.3. CARBON REDUCTION

Carbon reduction is a crucial objective for a company. Companies' internal activities, like processes of production and products itself cause a certain amount of carbon emission. As already highlighted in previous chapters, many governmental and non-governmental initiatives have been taking place to contrast pollution. Currently, there still no clear methodology for the reduction of carbon emission within a company. Thus, it is possible that some countries will discover an environmental policy which could be fruitful for other States. A relevant example is the adoption of a political, environmental strategy from the European Union, which was in turn previously implemented by a state-member. The European Commission has indeed adopted under the EC Treaty, the UK scheme trading system for CO2 emissions related to energy consumption. The scheme, known as *the Carbon Reduction Commitment,* is implemented in those sectors which are non-energy intensive. The other sectors, have been already covered by the European Emission Trading System. A company, to adopt the CRC rules, shall buy in auction CRC's allowances. After that, CRC participants will be ranked based on their environmental performance. The best environmental performers will receive auction revenues under the form of subsidy. The main purpose of this commitment is to induce a change of companies' behaviour toward an eco-friendly approach. The way through which it strives to reach that goal is by giving incentives according to companies' environmental performance. Companies which have adhered to this commitment should compete for the achievement of subsidies. In this context, competition does not create too much distortion under European Commission point of view. EU Commission judgment, find its foundation in the low amount of auction income, and so, in subsidies. In England, the process of distribution of auction incomes in the form of subsidies is seen as a state aid. However, European Commission notes that such state aid was in line with EC Treaty principles. Indeed, CRC pursues a goal which is of public and common interest. Targeting carbon reduction, is a proposal which is suitable for all members of the Eurozone (European Commission, 2009).

2.3.1. Carbon measurement & policy

Before applying suitable strategies for carbon reduction, an accurate detect of the amount of carbon emission and its implications is vital. In this way, it is possible to have a clearer idea about this issue and to predict its future trend.

According to the study of Caetano *et al* (2009), it has been shown a method that countries and companies can adopt to meet Kyoto Protocol carbon reduction targets. Such method is defined as: an optimal tracking control to force the concentration of CO2 to follow a pre-defined target. In this study, the pre-defined target is those established by the Kyoto Protocol. Even though nowadays other important agreements are established, the topic is to understand the implications of this method. Based on a mathematical model, it is shown that carbon emission reduction is strongly correlated with investments in reforestation and in clean technology. The main problem is that such investments could be very expensive for Governments and companies. The model proposed by Caetano *et al.* help to create scenarios for the evaluation of expected costs incurred in a specific climate policy. This model allows a balanced evaluation of possible climate policies taking into account investments availability constraints (Caetano *et al,* 2008, p.2536).

A well-known methodology concerning evaluation of environmental, but also economic and social impacts, is the *Life Cycle Sustainability Assessment*. LCSA is a broader concept of the Environmental life cycle assessment. LCA, which refers to the control of pollution, resource and energy, was born between 1960s and 1970s, when environmental issue started becoming of public concern (Druckman *et al.* 2016, p.46.).

LCSA aims to cover all the three dimensions of sustainability, they are: people, planet and prosperity, while LCA focuses only on the environmental aspect. LCSA includes Life Cycle Assessment (LCA), Life Cycle Costing (LCC), Social Life Cycle Assessment (SLCA) (Druckman *et al.* 2016, p.48). Life Cycle Costing aims to optimise total costs of asset ownership, by identifying and quantifying all the significant net expenditures incurred. LCC makes uses of suited statistical techniques to forecast future costs of ownership (Woodward, 1997, p.343). Social Life Cycle Assessment allows the identification of technological, physical, economic and behavioural relationships within a company. To do this, SLCA adopts quantitative indicators. Currently more data

and indicators are required for SLCA. Such dimensions, are the "three pillars" of sustainability. LCSA is a trans-disciplinary framework for integration of models, so it shall not be considered as a model itself (Druckman *et al.* 2016, p.48). To reduce uncertainties related to sustainability issue, through SLCA, it is possible to evaluate future scenarios of a company for its improvement according a sustainability point of view (Druckman *et al.* 2016, p.45).

The most common way to track and quantify carbon emission is the carbon footprint method. Features and implications of carbon footprint are already described on paragraph 1.2.1 (carbon footprint).

2.3.2. Product improvements

Products are subjects to an ongoing development made by companies especially for a reason concerning economic competition. Each company aims to enhance its products to gain a competitive advantage. Product improvements could be made in various forms, but it should be bounded by demand requirements. The increasingly awareness of environmental issues, has led to a change of demand toward sustainable products. Companies shall develop their products not only considering aspects like efficiency, effectiveness and quality, but taking into account environmental constraints too. Producing sustainable products entails additional costs. A proper strategy to minimize costs and environmental policies should enable the development of sustainable products.

The *European Ecolabel* is a European sustainable product policy. It is a voluntary label aimed at promoting products which are considered to be sustainable. Since 1992, it has been identifying products and services that are characterised by few environmental impacts throughout their life cycle. EU Ecolabel is supported by the *Joint Research Centre,* which in turn come from the EU Science Hub. JRC analyses products under many aspects, especially from an environmental point of view. Through this analysis JRC develops and proposes some specifications to improve product's performance of 10-20%. The proposal would become a legal instruction which will satisfy consumers and industries' needs (European Commission, 2018). This policy is proposed as a support for those companies which wants to improve their products.

The need for a sustainable development, has led companies to adopt methods to impact the environment as little as possible. In Tam *et al* (2006) research, there are three main waste minimisation strategies, called *3Rs,* and they are: reuse, recycle and reduction (Tam *et al.* 2006, p.210).

Waste reduction could be made by identifying the causes of waste, then apply a plan tailored to a specific company based on its characteristic and starting reducing waste. The reuse of materials depends on its physical nature. Some material could not be reused and others could. Whether it is possible, it is vital to work with materials which will not be wasted. One of the waste strategies minimizing impacts, is recycling, which grants three advantages. The first advantage is the reduction of the demand of new resources, the second one is the reduction of costs such as transport costs and those related to energy production. The third benefit is that recycling disincentivises the usage of landfill sites (Tam *et al.* 2006, p.210).

From an economic point of view, recycling is convenient only when a recycled product is competitive with the exploitation of natural resources in relation to its cost and quantity. Specifically, recycling will be more affordable in those areas where there are few raw materials and landfilling sites too (Tam *et al.* 2006, p.212).

2.3.3. Process improvements

A common and efficient strategy for carbon emission reduction is to align corporate process of production consistent with environmental requirements. Improving the process of a company is very complex because many internal aspects should be covered. The intrinsic nature of resources adopted and the way of producing are key element to enhance for the achievement of environmental goals.

Pursuant to Article 13 of the *Industrial Emission Directive* (2010/75/EU), a BAT reference document is applied at European level. In this document, activities and techniques for the determination of *best available techniques* are described. BAT regards techniques which ensure low emission levels whiting a company. The European *Integrated pollution prevention and control* bureau, involves the main representatives' European participants to define BATs. BAT's

guidelines are established with the contribution of European Member States and their main industries (Environmental Protection Agency, 2019.).

In Italy, a national authorization which allows companies to comply with IPPC principle, is the "*Autorizzazione Integrata Ambientale*" (AIA). AIA is mandatory for industries and activities like: energy, metallurgic, mining and raw materials, waste management, food industries and others (arpa FVG, 2019).

Types of resources which are considered to be suited with a corporate environmental performance are the renewable ones. Their intrinsic characteristic is that they are able to be reused through time. Some of them have an endless supply, for instance: solar energy, wind energy and so on. Others require some time and effort to be recovered. Examples of renewable resources are: wood, leather, fish oxygen, biofuel and energy generated from renewable organic products. Although prices of renewable resources are in general very high, their demand is still increasing. The ongoing growing trend of the worldwide demographic population, requires the usage of such resources. Thus, according to the law of supply and demand, prices of renewable resources like biofuels, are going to be more competitive related to their traditional substitutes. Many policies are enabling such price competitiveness (Barton, 2019). Relying on Wang *et al* (2018) studies, *green supply chain management* (GSCM) refers to the application of environmental management principles in the design, procurement, manufacturing, assembling, packaging, logistics and distribution activities. (p.673.). GSCM is divided by internal and external drivers. The main external drivers are: regulatory concerns, customers, competition, society and suppliers. Internal drivers of GSCM currently identified are: company reputation, strategic orientation, employees' commitment, waste reduction, quality improvement and top management support. Based on Wang *et al* (2018), there is not already enough literature concerning those drivers in relation to GSCM. However, the degree of relevance of external and internal drivers differs from company to company, according to their size, type of business and place (Wang *et al.* 2018, p.674). Internal drivers take place as consequence of company's establishment to undertake environmental actions. While external drivers assume the interaction with stakeholders. According to Laari *et al.* (2015), internal GSM practices enable the adoption of external ones (p.1960.). Often, when green practices are required only by stakeholders, some negative consequences could affect a company. For

instance, green practices combined with supply chain management, may involve less performance of a company in terms of efficiency. Indeed, under stakeholders' pressure, it is possible that managers could not be willing to invest in green practices for an economic reason. Even if such investments ensure long term cost savings due to waste reduction and closed-loop systems, it could be possible that investment costs in the short period are evaluated as too expensive. Thus, comparing long term benefits with short term costs, in this case often negative consequences prevail (Wang *et al.* 2018, p.674.).

2.3.4. Carbon compensation

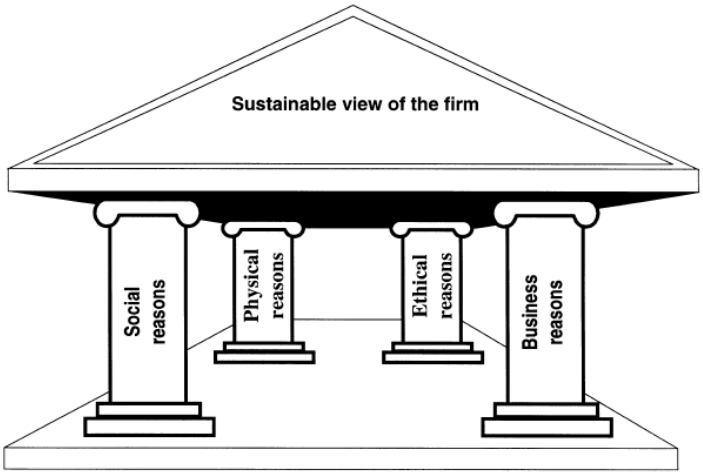
In paragraph 1.2. (Carbon emission policy) of my thesis, there is a short description of carbon compensation dynamics and principles. The topic of this new paragraph is to analyse how is carbon compensation theoretically implemented.

The European *emission trading system* (ETS) is the greatest carbon market in the world. It operates in line with the *cap and trade* principle. In this context, cap is referred to the total amount of carbon emission which is permitted by the EU ETS. Companies, which have joined EU ETS policy, have the possibility to trade emission allowances; for instance, whether a company is not able to reduce carbon emission in a specific activity, it is in the condition to buy carbon allowance from another company. The logic of this policy is that paying for carbon emission allowance, should discourage carbon emission itself. The EU ETS estimates that in 2030 the overall amount of carbon emission reduction in the Eurozone will be of 43% lower. To facilitate this, EU ETS is trying helping low carbon transitioning companies through incentives in the future. Industries which are currently obliged to follow EU ETS rules are those with energy-intensive activities. So, companies which work with materials like steel, iron, aluminium, metals, cement glass, acids and so on. But the main target is the involvement of as much sectors as possible in the future (European Commission, 2019). As we have already seen in the introduction of the paragraph (CARBON REDUCTION), a way to expand this policy to other sectors like non energy ones is yet implemented.

2.4. CARBON COMPETITIVENESS

Companies willing to conduct a sustainable activity, should consider the coexistence of two aspects. The first one is the scarcity of natural resources, and the second one is the awareness of being co-responsible of the use and the development of social resources within a society. According to Rodriguez *et al* (2002) study, the sustainable view of the firm is divided in four main pillars. These four pillars are interconnected and enable the creation of sustainable value. In this context, sustainable refers to the realisation of value persistently and, at the same time, in line with sustainable development principles. Indeed, sustainable value includes economic, environmental and social values. The first pillar of the sustainable view of the firm regards *physical reasons*. With the development of the society and the increasing number of companies, especially after industrial revolution, problems like limited availability of natural resources and pollution have been arising. In physical resource management a *normative approach* is vital. It consists in putting some limitations on what firms should do or not to safeguard the environment. The mentioned theory provides also for the *instrumental approach* in this context. Companies should operate considering natural constraints with the prospective of developing new strategies and capabilities (Rodriguez *et al*. 2002, p.137).

Figure 4. The Four Pillars of the Sustainable Firm



Source: Rodriguez *et al*. 2002, p. 137.

The second pillar is covered by *social reasons*. Corporate social responsibility is strongly correlated with society's demand. Over time, individuals have been becoming even more educated and informed. Thus, a strength in requiring companies an active role in social needs has been taking place. Often, the demand of the society takes the form of legal rules. A clear example could be the implementation of environmental rules. So, companies should follow legal and informal demands. The third pillar is linked with *ethical reasons*. The multitude number of goals (economic, social and environmental) which a company should reach, entails an improvement in its internal and external ethic obligations. Theoretically, conducting a corporate ethical behaviour, will enhance cohesion with all firms' stakeholders (Rodriguez *et al.* 2002, p.138).

The last pillar regards *business reasons*. The previous three pillars are all characterised by a normative and instrumental approach. In other words, each of them is legally regulated. Moreover, at the same time, Rodiguez *et al.* studies have analysed the proper behaviour to overcome, physical, social and ethical issues. Whether companies are able to act in a consistent way taking into account not only legal constraints, but also because they believe seriously in sustainable development, their business will create competitive advantage (Rodriguez *et al.* 2002, p.139).

According to this study, company's ability to generate persistent revenue depends heavily on its ability to create social value through ethical behaviour (Rodriguez *et al.* 2002, p143.).

The thesis will analyse theoretically corporate activities related to carbon performance in order to study in deep company's sustainability under the environmental perspective.

2.4.1. New Markets & Product Development

Sustainable products help companies to reach new markets. To do this, an innovation strategy suitable with environmental requirements should be implemented.

Relying on De Marchi (2011) research, environmental innovation is the key activity which is able to link corporate strategies including environmental issues and maintain competitive advantage. Environmental innovation is a type of

innovation strategy which has not been studied deeply yet. However, this research proposes environmental innovation suitable with R&D activity by cooperating with external partners (De Marchi 2011, p. 614).

Environmental innovation concerns the realisation of new processes, techniques and products which decrease or avoid environmental harms. Innovating for environmental reasons could be made via incremental or radical improvements. While traditional innovation made through R&D activities generate good externalities such as knowledge spillover, environmental innovation creates social value by reducing environmental damages. Even though traditional innovation performs better with the cooperation of two or more actors, instead of using internal resources only, for environmental innovation cooperation is more relevant. Innovating sustainable products and processes is a complex activity which could be facilitated with the interaction of different stakeholders. Environmental innovation should be considered as systemic. Innovating in this field, requires the involvement of many actors, for instance, it could be necessary to change the type of raw materials, type of logistics and a re-design of the new product (De Marchi 2011, p. 615).

R&D cooperation in the environmental context, enables transaction costs reduction and enable the share of risks associated. The main external partners are suppliers and scientific agents. Suppliers can contribute with the sharing of technological knowledge, skills and ecological resources. Scientific agents could be universities research centres and consultants. These types of cooperation strength environmental innovation, while cooperative agreements are considered to be as well important as for traditional innovation. Moreover, internal research and development approach does not give any additional value added for environmental innovation. The systemic feature of environmental innovation is expressed by the fact that environmental innovation depends not only on the firm's characteristics, but also on internationalisation strategies; indeed, environmental policies foster environmental innovation of companies (De Marchi 2011, p. 621).

2.4.2. Stakeholder engagement

Stakeholder engagement could be made in various forms. It could be made directly with companies or through cross-sectoral or sector-specific trade associations, political actors and non-governmental organisations for the implementation of environmental initiatives (Damert *et al.* 2017, p. 126).

A trade association of considerable importance in collaborating with companies for environmental reasons is the *World Business Council for Sustainable Development*. WBCSD is a worldwide CEO-led organisation composed by 200 leading businesses which cooperate to encourage sustainability all over the world. Member companies are economically relevant and very impactable on the society. Indeed, the sum of their revenues is around 8.5 trillion of dollars and they have 19 million employees in total. The organisation was set up in 1990 by the United Nations to create a business environmental and sustainability awareness around the globe. WBCSD build collaborations, develop tools, guidance and reports case studies to help companies with the evaluation of environmental, social and governance information. Thus, companies are able to measure risks and obtain competitive advantage. Between several activities, WBCSD finds out solutions for climate change mitigation. It operates between companies and governments to guide the implementation of climate change policies (WBCSD, 2019).

A typical example of political organisation acting to connect companies and potential stakeholders is the *UN Global Compact*. The UN organisation is the world's largest corporate sustainability initiative. UN Global Compact's mission is to involve companies and stakeholders to take initiatives according to principles on human rights, labour, environment and anti-corruption. Its targets are described in the Sustainable Development Goals by 2030. Participants engaging with UN Global Compact, will benefit from access to all its resources, platform and its activities (UN Global Compact, 2019).

An interest case study concerning Shell, a great company in the oil and gas industry, shows the importance of stakeholder engagement. In 1998, Shell caused environmental problems because of a series of action undertaken. The main discussed event was those concerning the case of Brent Spar. Brent Spar was a floating platform over the North Sea near Brent city. This platform was used by Shell as a sort of tanker lasing buoy in the oilfield of the homonym city. In 1991,

it was not considered functional anymore. Few years later, Shell wanted to dispose it in the deep of the Atlantic with the UK governmental support. The association Greenpeace organised a Brent Spar occupation to stop this pollutant operation and to attract media attention. Under external pressure, Shell decided to interrupt its initiative, but it still considering that deepening it on the ocean was the less pollutant intervention for the environment. To confirm this, it was discovered that Greenpeace's estimation of the quantity of oil in Brent Spar was overestimated. Consequences aroused from this event, has damaged Greenpeace and especially Shell's image. But the real negative consequence for Shell was that relationship with important partners, like Exxon and its trade associations, lead it to apply a broader and better communication to obtain transparency with stakeholders. From that moment, it decided to disclosure its environmental strategies and outcomes (Politico SPRL, 2019).

2.4.3. Corporate Communications

According to the COSO's framework, non-financial communication report analyses firm's strategies under five main aspects. The first area concerns control environment: it means the methodology applied by a company for the evaluation of pollution emission and the related strategy adopted. Secondly risk assessment, related to corporate responsibility. Then control of activities, which means the documentation of all the operational activities. Information and communication given to both internal and external stakeholders entail value added due to a precise non-financial communication. Monitoring activities are the last part of a non-financial report where internal processes and controls are correctly supervision (pwc, 2019).

In the world there are many tools to communicate financial and non-financial information. The current trend seems to converge toward unique standardised tools. Clearly, this process requires time.

Corporate Sustainability Report improves the transparency of companies' activities. From the firm's point of view, CSR grants two main benefits. The first advantage is that companies are able to quantify and evaluate the impact on environment, economy and society of their activities. This function reveals that CSR acts also as internal communication system. Companies are allowed to

optimize their resources, such as energy consumption, and they are prone to innovate products for the realisation of economic and societal good externalities. The second benefit is the communication to stakeholders of their sustainable short- and long-term goals and their strategies to reach them. As far as external benefits are concerned, companies are able to strength stakeholder's engagement by attracting new potential partners and consumers (E-CSR.Net, media platform and network, 2017).

CSR is not yet mandatory for companies. According to the European Union directive (2014/95), only large listed companies are obliged to disclose their non-financial information. Listed companies, banks, insurance companies and holding groups which are subject to a mandatory non-financial reporting are those with more than 500 employees. They should demonstrate that they are in line with EU policies concerning: environmental protection, social responsibility, anti-corruption and human rights. They have the possibility to submit European or national guidelines for the realisation of the statement (European Commission, 2019).

Criteria to implement CSR internally and externally are various. The most common one is by following ISO 2600 standards (which will be explained next paragraph). Otherwise, a personalised template is allowed, but it is very difficult to follow a scheme which could be considered reliable from stakeholders. Thus, often companies rely on preestablished guidelines made by international organisation like the GRI (E-CSR.Net, media platform and network, 2017).

Considering internal non-financial disclosure, Q-RES Project is a typica international example. It was founded in 1999 by *CELE-Centre for Ethics, Law & Economics* at an Italian University. This project contains a set of guidelines for the creation of a management model considering ethical and social responsibility. Q-RES model is based on the principle of observability and verifiability by external entities. To do this, a social contract between firm and its stakeholders should be made (ResponsibleCapitalism.it, 2002, p. 4). Social contracts will bound stakeholders to cooperate creating sustainability value especially within a company.

In paragraph 1.2.2. (carbon disclosure) an overview of the strategies adopted by the CDP to reduce carbon emission was made. CDP set a program for topics like climate change, water waste and forestry. For each CDP program, a

suitable questionnaire is applied. Companies are submitted to a questionnaire tailored with they own type of industry. The questionnaire serves for the evaluation of a company's environmental performance. It includes a scoring methodology following chronologic macro topics concerning corporate activities. For instance, for the CDP climate change program, questionnaire follows these aspects: Governance, Risks and opportunities, Business strategy, Emission methodology, Emission data, Emission breakdown, energy, additional metrics, verification, carbon pricing, engagement. After the submission, CDP evaluates and ranks a company based on its environmental performance (Carbon Disclosure Project, 2019).

Integrated Reporting, managed by the *International Integrated Reporting Council*, is a financial and no financial document on international basis aiming at communicating value creation of a firm. This document gives further information to stakeholders than a tradition corporate reporting. Indeed, it explains company's financial performance and its sustainable development. The IIRC is an international no profit organisation composed by regulators., investors, companies and standard setters. The main IRRC activity is to help companies and organisations which are facing with integrating Reporting. Currently, IIRC is in the "Momentum Phase" of its mission. It is acting to make the integrated reporting a global, standard rule. The International Integrated Reporting improves the quality communication of financial, governance and sustainability corporate information (International Integrated Reporting Council, 2019).

2.4.4. Political activities

This thesis has already broached the issue of environmental policy, especially related to the political pressure over companies for pollution reduction. The focus of this paragraph will be the analysis of the main environmental standards and certificates for companies proposed or imposed by the European Union.

ISO 14001:2015 and ISO 14004:2016, are related to the *Environmental Management System*'s requirements and implementations. Any company should adopt EMS to enhance its environmental performance. Through this guideline, a company should manage environmental issue in a systematic manner to create

value added for the entire society. Following these guidelines, a company will fulfil compliance obligations. For non-obliged companies, it is not mandatory to follow all the EMS instructions (International Organisation for Standardisation, 2015)

Environmental labels and declarations' instructions are implemented in the ISO 14020:2000. According to the sector in which companies operate, they might be obliged to communicate some environmental labels and declarations. Stakeholder, especially suppliers, often need these labels for a legal collaboration (International Organisation for Standardisation, 2000).

Related to EMS, ISO 14031:2013 explains the *Environmental evaluation performance*. Steps concerning the modality for the realisation of *Environmental performance evaluation* are described and there are not preestablished levels of performance. Estimating pollution in a precise manner, prevents its improvement (International Organisation for Standardisation, 2013).

Carbon footprint is one of the most efficient method used by companies to estimate their carbon emission. European Union rules guidelines for this procedure. ISO 14067:2018 is the latest version of *Carbon footprint of products*. Despite previous standards, this one is related to climate change only. Requirements and guidelines for the quantification of product's carbon footprint are illustrate. Information related carbon compensation and carbon communication are not complied in this standard (International Organisation of Standardisation, 2018).

CHAPTER 3

RESEARCH METHODOLOGY

This study relies on a qualitative analysis of the carbon emission mitigation process within a company. The choice of this approach stems from the fact that it is considered more suitable with the research question and the objective of this work.

Qualitative research aims to explain how and why a particular phenomenon, in this case: how a company applies carbon strategy, considering a specific context. Qualitative descriptions help to identify eventual causes, relationships, effects and dynamic implications arising the implementation of a corporate carbon strategy. This type of investigation could be made in many ways, for instance it could be made through: questionnaires, documents, participant observation, ethnography and so on. The methodology adopted in this case concerns interviews. Through questionnaires, respondents are allowed to explain in depth and with its own word the answers. Qualitative data regards also photographs, videos and sound recording. Thus, it is permitted to understand and interpret information and formulate solutions which are reliable only within the specific context. Any conclusion or solution applicable in absolute terms could be formulated through a qualitative investigation. The theory mentioned in this work, represents a part of the research and it is linked with data collected from the case study (McLeod, 2017).

The tool applied for this research consists on a questionnaire of 57 questions structured according to the corporate carbon strategies' pattern. Most of these questions, are divided in turn in two or more questions in order to deepen the topic related. For instance, question number x, could be divided in turn in other demands ranked through letters, like xA, xB, xC and so on. Criteria for the implementation of such questions takes cue from Damert *et al.* literature and from consistent topics directly investigated by myself. Questions are organised in line with the three main corporate objectives and the ten related activities identified in the Damert *et al.* (2017) framework. In this way, information obtained by the case study will be interpreted according to this theoretical framework. Before developing the corporate carbon strategy's theoretical

framework, initial demands of the questionnaire concern some basic information about the interviewee and a brief description of the activity of the company [See Appendix: questions 1A, 1B, 2A, 3A]. Subsequently, general questions concerning firm's characteristic like its core business, its size, its hierarchical structure and its corporate culture are demanded [See Appendix: questions 4A, 4B, 5A, 6A, 7A, 7B, 8A, 8B]. Then, the principal topic of the questions is related to the corporate carbon strategies' theoretical framework. General questions to understand the company's reaction to environmental threats are made [See Appendix: questions 9A, 10A, 11A, 11B, 12A]. In this phase, the three main strategic objectives of the theoretical framework are developed through a set of questions. So, the questionnaire includes suitable questions related to carbon governance, carbon reduction and carbon competitiveness objectives. In turn, questions related to each activity are structured in order to develop strategic objectives associated with them. Questions related to the carbon governance strategic objective concerns the informal internal communication of the company [See Appendix questions 13A, 13B, 13C, 13A, 43B]. The first activity of Carbon Governance is Organisational Involvement. In this section, questions focus on the way in which the company is organised to implement its corporate carbon strategy [See Appendix: questions 15A, 15B, 16A, 17A, 17B] and which working position is required to solve environmental issues [See Appendix: questions 20A, 20B, 21A]. The other strategic activity of the first objective is Risk Management and questions about the nature of environmental risks and their implications are formulated [See Appendix: questions 22A, 22B, 23A, 24A, 24B, 25A, 25B].

The second strategic objective, Carbon Reduction, is made up of questions related to four strategic activities. They are: Carbon Measurement & Policy, Products Improvements, Process Improvements and Carbon Compensation. Questions about Carbon Measurement & Policy activity refer to the approach that the investigated company applies to quantify and evaluate pollution and waste [See Appendix: questions 26A, 26B, 27A, 27B, 28A]. In the Product Improvements activity, questions are made to discover if the company implements projects to enhance its products and applies performance indicators [See Appendix: questions 29A, 30A, 30B]. Questions oriented toward recycling and packaging methodology follow [See Appendix: questions 31A, 32A, 32B, 33A, 34A, 35A, 36A]. For the Process Improvements activity, questions about the

supply change management adopted by the firm were submitted [See Appendix: questions 37A, 37B, 38A, 38B, 38C]. In the questionnaire, there are also two questions about Carbon Compensation activity [See Appendix: questions 39A, 39B].

In the third strategic objective, Carbon Competitiveness, there are some questions fitting the related activities. The first activity is New Markets & Product Development and few questions concerning environmental research and development are applied to the interviewee [See Appendix: questions 40A, 40B, 41A]. The second activity associated with the last strategic objective is Stakeholder Engagement, questions about the relevance of the role played by stakeholder for the analysed company are made [See Appendix: questions 42A, 42B, 43C]. Concerning the third strategic activity, Corporate Communications, the topic of the questions regards how the company discloses environmental information [See Appendix: questions 43A, 44A, 45A, 45B, 45C]. The fourth strategy activity, namely Political Activities, was developed through questions concerning environmental certifications and initiatives of the company interviewed [See Appendix: questions 46A, 47A, 48A, 48B, 49A, 49B, 50A].

At least, some questions about possible economic advantages or disadvantages aroused from the corporate carbon strategy adopted. Such questions aim to discover whether the analysed company identifies and measures environmental costs in order to improve its economic performance [See Appendix: questions from 51 to 57].

Such questionnaire was submitted to the Speedline S.r.l. company, belonging to the mechanical engineering industry.

Mechanical engineering is one of the best sectors in Europe in terms of performance. In the EU, this sector realises the 9.5% of the overall manufacturing production industry. Over the next 10 years, mechanical engineering industry is forecasted to growth of 3.8% per annum. Since mechanical engineering's activities are very impactful for the environment, EU Commission has been implementing rules to promote global and sustainable competitiveness in this sector. To confirm this, an increasing demand from stakeholders for a stronger European surveillance over this sector has been taking place. (European Commission, 2019).

The choice of the mechanical engineering industry, stems from the fact that it is environmentally sensitive. Indeed, mechanical engineering industry's intrinsic characteristic is to create lots of pollution. Many regulations under European and National level for the mitigation of such negative externality are required. The investigated company is a non-listed large company. According to these characteristics, the company is not requested from the European legislation to disclose non-financial information through sustainable reports. The investigated company is able to disclose such data only voluntarily without following a standardised methodology. For this reason, the focus of this study is not related to their environmental performance as a whole, but on the modality through which they govern carbon emission. Another important element to be considered for this investigation, is that the company is located in an Italian county: Venice. Venice is a city of the Italian macro-region denominated as: Nord-Est. Relying on the "CUOA Business School" and "Fondazione NordEst research", 62% of the local companies interviewed have voluntarily undertaken at least 5 environmental policies, such as environmental initiatives (Il NordEst Quotidiano, 2019). Environmental and sustainability awareness has been increasing in this area. For this reason, the company is investigated to understand whether it undertakes environmental initiatives too and in particular which strategy it adopts to reduce carbon emission. Once defined the industry in which the company operates and its location, the objective will be to discover the main determinants which affect positively its corporate carbon emission strategy.

The first step of the investigation was to interview the company. The meeting took place on 19 April 2019. It started at 9:30 in the morning and lasted 6 hours. In the first part of the day, I was invited to observe their entire allow wheels production process. In this way, it was possible to have a physical interaction with the company and obtain information in a direct way. After that, I submitted the questionnaire to the Senior Manager Environment Health Safety of the company. The environmental responsible has answered to all questions. Under the authorization of the company, I had recorded the interview. Once finished the investigation of the company I combed through the recorded interview and I wrote the answers by following the corporate carbon strategy framework. After that, I have elaborated the information gathered from the interviewee. In the process of elaboration, I have mentioned only some specific

answers of the interviewee. I have selected those I considered most relevant, while through the information obtained from the others, I have done an explanation of the Speedline carbon strategy. Then, I have commented each question by linking them to the literature of corporate carbon strategy. Finally, I had sufficient data to formulate Speedline's corporate carbon strategy and the most effective determinants contributing in the realisation of the carbon mitigation performance. Results obtained should be considered under specific constraints such as: the sector and the area in which the company operates and its size.

CHAPTER 4

CASE STUDY

4.1. SPEEDLINE S.r.l.

Speedline S.r.l. began operating in 1967 in Santa Maria di Sala (Venice) and worked as an autonomous firm in doing alloy wheels production. In 2017, when Speedline was going through a financial crisis, it was acquired by Ronald Group S.p.A. Currently, Speedline is one of the 21 Ronal Group's branches settled around the globe. The corporate headquarter is located in Switzerland.

As far as Speedline S.r.l. concerns, the handler for the interview was the Senior Manager Environment Health Safety (SMEHS) of the company. He has been working in Speedline for 20 years. In the previous 10 years he had undertaken different roles within the company. In the last 10 years, he has been working as SMEHS and he has also the responsibility to coordinate Speedline's environmental policies. The role of SMEHS is to coordinate and organise all the activities concerning environmental and safety issues. He should also communicate to the key stakeholder the programmed activities and their outcomes (Rent the Runway, n.d.).

Speedline's main business is alloy wheels production. Its activity is characterized by the use of sustainable products. Indeed, their unique finished product is composed by aluminium, which can be repeatedly recycled. Regarding its processes of production, Speedline aims at minimizing as much as possible energy consumption. Since this activity is characterised by sustainable processes and products, it is required a thorough examination and control of the entire production process for the minimisation of both costs and carbon emission.

Speedline's organisational structure is functional. It comprehends a board of directors which is supported by the staff. Staff team includes: quality management, environmental management (where the handler operates), human resources management and finally there is a staff for the implementation of special projects. In the line of organisational structure there are a sales office, the

supply chain management, a purchasing department, an administration department (where it is made business accounting), a financial department, an engineering department, an infrastructure office and a communication lab. The production department, which represents the main activity of Speedline, is composed by a lot of operatives working shifts. Production activity takes play all day, including the weekend. The only exception is related to the painting of alloy wheels, which is executed only in the working days. Speedline' structure allows the development of individual, specialised skills. As described by the manager, Speedline is divided in to many departments, each of them is specialised for a specific function. The type of business communication is top-down. Speedline is a large company, to confirm this, they have 650 employees. The number of employees concerns only those of Speedline s.r.l., which is one of the Italian branches of the leading company Ronal Group. Considering the sector in which Speedline operates, it has to comply with legislatives constraints and with Ronal Group's environmental targets. To do this, its dimension is not considered to be a relevant requirement.

A sustainable company like Speedline, should engage a figure like the Corporate Social Responsibility manager to improve its social and environmental performance. Corporate Social Responsibility managers have the role of find out ideas for the implementation of activities and initiatives within a company aimed at achieving positive outcomes in terms of environmental impact. For the achievement of such goals, they are also engaged to build relationships with other organisations. This type of figure is considered to be as an internal and external representative of the corporate social policies (All About Careers Ltd, 2017). For the implementation of its social and environmental policies, Ronal Group is planning to hire a profile with such characteristics.

In the case of Speedline, environmental initiatives are due to external factors. Specifically, policies adopted at European and Italian level, oblige this company, which operates in the mechanical engineering sector, to complain with environmental constraints. In this regard, the SMEHS manager explained: *"Considering the sector in which we operate, the main reason of conducting a sustainable activity relies on the mandatory nature of law. Companies in our sector are obliged to take care of the environmental aspect. Before AIA certification, there was another legislative decree 203/1988, in which some*

limits were imposed. Currently, AIA certification is required"[8]. However, the manager is fully aware that mitigating companies' carbon emission would enhance significantly the problem of climate change. Speedline confirms what the Paris Agreement reveals about the central role that companies play in the carbon mitigation process (as it is described in paragraph 2.1 of the thesis). Since alloy is a material which entails a lot of energy for its transformation, Speedline reacts to climate change issues by organizing its activity production in such a way that the consumption of energy would be as low as possible. Moreover, Speedline aims at recycling as much as possible. The interviewee manager supports the idea that carbon emission represents the main cause of corporate pollution.

4.1.1. Carbon Governance

Speedline's informal communication for the resolution of environmental problems is done mainly among figures that are specialised in this field. Anyway, company's culture involves all employees to conduct a suitable behaviour. For Speedline, a process of sensitisation of employees toward environmental topic is a value added for the company. Issues related to CO2 reduction, are not known in detail by all the internal stakeholders. Main informal communication is made between the SMEHS manager and the infrastructure office for the resolution of environmental problems. The types of informal communication which is considered to be effective for Speedline are: sending e-mail, phone calls and putting guidelines on bulletin boards.

Speedline's organisational involvement for the governance of environmental issues regards relationships among specialised figures. As far as specialised figures are concerned, the SMEHS manager pointed out that another relevant figure is included in this company. He stated: *"We also have the figure of the Energy Manager, who is required by law whether a company uses a level of energy consumption greater or equal to 15,000 tep. In our case, we are*

[8] *Dato il settore in cui operiamo, il motivo principale sta nell'obbligatorietà di legge. Le aziende del nostro settore sono obbligate ad interessarsi dell'aspetto ambientale. Prima della certificazione AIA, c'era un altro decreto 203/1988, nel quale venivano imposti dei limiti. Ad oggi, è necessaria l'autorizzazione AIA*[8].

obliged to have it"[9]. Due to the large production volume of this company, the relative energy consumption is large too. So, Speedline should have an Energy manager. At the same time, every member of the company contributes with his/her behaviour. For instance, Speedline provides their employees an electric bike to move from their home to work and then to come back. This initiative comes from a project implemented by Ronal Group toward all its branches. The project is called Planblue and it concerns a set of initiatives aimed at reducing carbon emission (Ronal Group, 2017). Ronal Group organised the Bike2RONAL campaign where employees of all its branches are requested to go to and from work in a less pollutant way as possible. This campaign lasted one year in the from April 2017 to march 2018. Ronal Group monitored from April 1 2017 to march 31 2018 how employees had reduced pollution during their travel to work and after that it had given to the best travellers prizes concerning free e-bikes According to the theory of employee business awareness of Haines *et al* (2012), the involvement of all the internal actors of a company boost the environmental performance. In the case of Speedline, informal communication enables such general involvement. Internal stakeholders who work to reduce carbon emission, are not required to attend a specific training course, while those operating in the workplace safety department should have done some specific courses. Business culture could be influenced positively through various initiatives like incentives for environmental performance. To this regard, the manager answered: *"Our leading company Ronal Group S.p.A., to encourage carbon reduction, evaluates yearly its branches' performance. At the end of the year, the branch which achieved the best outcome in terms of carbon reduction, will receive a bonus, while the one which obtained the worst result will receive a penalty"*[10]. This type of incentive system adopted by the leading group Ronal Group, motivates its branches to perform better. To understand whether prizes and penalties take the form of money, the manager specified: *"Yes, prizes and penalties take place in monetary form. So, the company which has obtained the worst result will pay*

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[9] *Abbiamo anche la figura dell'Energy Manager, il quale risulta obbligatorio per legge nel momento in cui una azienda utilizza un livello di consumo energetico superiore o uguale a 15000 tep. Nel nostro caso, siamo obbligati ad averlo.*

[10] *La nostra azienda capogruppo Ronal Group S.p.A., per incentivare la riduzione dell'emissione di CO2, valuta le performance delle sue sedi ogni anno. A fine anno, la sede che ha ottenuto il risultato migliore in termini di carbon reduction, riceverà un bonus, mentre quella che ha ottenuto il risultato peggiore, riceverà una penalità.*

to Ronal Group a sum, which in turn will be donated to the best performed branch"[11]. This mechanism creates a sort of healthy competition among Ronal Group's branches in order to reach a common result. The result is the improvement of environmental performance, specifically by reducing carbon emission.

The way through which Speedline manages risks, concerns the identification and classification of potential threat and opportunities. This approach is applied in all their activities and the manager called it as: *"Stakeholder analysis"*. Environmental risks are monitored too; the manager explained*: "As far as environmental aspect concerns, we have listed risks arising from the volatility of aluminium and energy's price. The price of aluminium is postively correlated with that of energy. Protection measures are undertaken by Ronal Group"*[12]. Due to the volatility of the prices of aluminium and energy, Ronal Group has to bear those risks. The manager could not say whether Ronal Group implements a hedging strategy to reduce such risks or not. This hedging strategy could be made through derivatives like future or forward, or through insurance. The main opportunity arising from environmental issues is the improvement of brand image. Despite the fact that Speedline is oblige to mitigate environmental impact, it can benefit from the improvement of its brand image. Risks due to the use of natural resources is managed by Speedline design phase of the alloy wheel. The less material the alloy has, the less will be its environmental impact. It is also true that the physical embodiment of the alloy requires a certain threshold in terms of quantity of raw material. Through simulation, Speedline finds the best outcomes to meet the trade-off between consistency of the product and its environmental impact. Speedline is an Original Equipment Manufacturer company, for this reason an eventual challenge to meet new customers' demand does not exist. An "Original Equipment Manufacturer" is a company that produces goods which are considered as components for other companies (Kagan J. Investopedia, 2019). Clients of Speedline are not final consumers, but automotive companies. So, Speedline is not able to change

[11] *Si, i premi e le penalizzazioni avvengono sottoforma monetaria. Per cui l'azienda che ha ottenuto il risultato peggiore dovrà a Ronal Group una somma, la quale verrà consegnata alla sede che ha performato meglio.*
[12] *Per quanto riguarda l'aspetto ambientale, abbiamo elencato i rischi derivanti dalla volatilità del prezzo dell'alluminio e dell'energia. Il prezzo dell'alluminio e dell'energia sono inoltre correlati. Le misure di protezione avvengono da Ronal Group.*

customer segments. Customer pressure over the mitigation of environmental problems is described by the manager in this way: "Our customers impose us specific environmental standards. There is a list called "Gadsl", in which are described elements that are not allowed to be included in a product. According to the International Material Data System (IMDS), for each product supplied, it is necessary to put the whole list of all elements utilised and their relative percentage"[13]. The international Material System is a standardised system created by the biggest companies in the automotive industry. In this way, communication of the characteristics of a company's product is easier to understand (Util Group, n.d.).

4.1.2. Carbon Reduction

Environmental policies within the company and the type of carbon measurement adopted by Speedline are well explained by the manager: *"Carbon footprint measurement is applied by the leading company Ronal Group"*[14]. The methodology applied for monitoring carbon emission is carbon footprint. Details related to the type of calculation made it is not clear, due to the fact that carbon footprint is implemented by the leading group. From the question related to targets implementation, the manager answered: *"We set monthly targets for CO2 and energy reduction. Each month, we compare them with the amount of CO2 actually emitted and the amount of energy actually used. Such measurement takes place both within the production process and transports. Ronal Group will draw up diagrams to have a clear view of Speedline and the other branches' trends"*[15]. In this company, carbon tracking is very strict and frequent. Notwithstanding the legal obligation concerning carbon mitigation, targets to be reached are established within the company. Specifically, the decision is taken by

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[13] *I nostri clienti ci impongono degli standard di impatto ambientale specifici. Esiste una lista chiamata "Gadsl" nella quale sono elencate le sostanze che non sono accettate qualora fossero in un prodotto. Secondo (IMDS) l' International Material Data System, per ogni prodotto che si fornisce, bisogna mettere tutto l'elenco delle sostanze dei propri prodotti e nella loro relativa percentuale.*

[14] *Viene applicata la rilevazione della carbon footprint da parte dell'azienda capogruppo Ronal Group.*

[15] *Stabiliamo mensilmente dei target di riduzione di CO2 e di energia. Ogni mese, li compariamo con la quantità di CO2 effettivamente emessa e la quantità di energia impiegata. Tale rilevazione avviene sia all'interno del processo produttivo sia nei trasporti. Ronal Group stilerà dei diagrammi per avere una chiara visione del trend di Speedline e delle altre sue sedi.*

the leading group. For the quantification of waste, the manager stated: "*We adopt carbon footprint methodology. Due to the ISO 14001 certification, the Life Cycle Sustainable Assessment is required*"[16]. As Druckman *et al.* (2016), we know those companies adopting LCSA should not improve just their environmental performance, but also the social and economic ones.

For the improvement of products, the headquarter Ronal Group has submitted to all its branches a project. The project is *Planblue*, it is an initiative which involves procurement of resources, production activity, products and recycling. Concerning products, Speedline alloy wheels are realised by reducing 20% of carbon emission in the production process. The product allows at least 3300 km of CO2-neutral driving and has a performance of 150,000 km (RONAL GROUP, 2017). Speedline has a proper monthly methodology for the quantification of waste. It has adopted a standardised methodology which should be adopted by all Ronal Group's branches. In this way, the quantity of waste can be compared among those companies. They set monthly targets for waste reduction and they measure either for harmful and non-harmful products. Waste recycling is vital for Speedline. They are very accurate in quantifying and classifying waste. The manager declared that their packaging is mainly composed by recycled material and he added: *"The alloy wheels are deposited at iron benches, some owned by Speedline, the others belong to other companies, since they are all the same. We apply sheets of polyethylene between the wheels to avoid collisions. These sheets, once used, we will send them to a company which recycles them in exchange of payment"*[17]. As far as the packaging concerns, Speedline relies on an external company. Each harmful material or product should have the relative safety data sheet in which characteristics of the elements are explained. Moreover, such elements are ranked through pictograms and differentiate with different colours. Safety data sheets are standardised by the GHS Global Harmonized System. Whether a company has some dangerous elements which are not scheduled, a fine of 18,000 € should be paid. Due to the

[16] *Ci avvaliamo del carbon footprint. Con la certificazione ISO 14001 del 2015 il Life Cycle Sustainable Assesment è richiesto.*
[17] *I cerchi in lega vengono depositati presso dei bancali di ferro, alcuni di proprietà di Speedline, altri che sono di altre aziende, poiché sono tutti uguali. Applichiamo dei fogli di polietilene tra un cerchio e l'altro per evitare urti. Questi fogli di polietilene, una volta utilizzati, li mandiamo ad una società che li ricicla e ci paga per ottenerli.*

type of production implemented by Speedline, a painstaking control over their products is considered to be mandatory.

To the question regarding process improvements, the manager of Speedline answered: "*The production process has always been the same, but we try to find out the most possible efficient equipment"*[18]. They tend to use almost exclusively battery-powered forklift. Industrial furnaces which shape alloy wheels consume the less as possible. For Speedline, the area where it has been able to improve regards only the equipment. Production process could not be radically modified, due to the fact that alloy wheels needs specific steps of production. Speedline selects suppliers only for the most important material as the manager stated: "*Currently we submit to suppliers a self-assessment because we do not yet have audits to evaluate them. For supplier such as those of varnish or waste, we require the ISO 14001 certification". (Attualmente facciamo fare ai fornitori un self assessment poiché non disponiamo ancora degli audit per valutarli. Ai fornitori di prodotti come vernice, oppure per quanto riguarda i rifiuti, chiediamo loro la certificazione ISO 14001".* According to the theory of the Green Supply Chain Management, for Speedline internal drivers like waste reduction, quality improvement are the key factors for their corporate carbon emission strategy. The external GSCM drivers that affect the company the most is regulatory concerns and suppliers. Planblue initiative provides the use of specific equipment to reduce waste in the production process. In particular, Ronal Group uses the Undercut, which reduces the consumption of alloy of 1kg per wheel, while Flowforming, which makes the wheel reach a weigh of 1.5kg.

The European emission trading system is a carbon market which allows companies to buy credits for carbon emission. In the case of Speedline, they do not adopt such measure. The reason relies on the fact this firm is able to reduce carbon emission in each activity.

4.1.3. Carbon competitiveness

As outlined from De Marchi research, the most efficient environmental innovation is by doing R&D cooperation. In this case, Speedline is not responsible

[18] *Il processo produttivo è rimasto sempre lo stesso, ma cerchiamo di trovare un equipment più efficiente possibile.*

for the implementation of environmental innovation but this type of activity is made by the headquarter Ronal Group. Its environmental innovation activity concerns substantially in researching the most efficient and less pollutant equipment in the market. They do not innovate new types of processes or products in collaboration with other stakeholders. So, they are not able to enter to new markets because their unique clients are automotive companies. Investing in sustainable products and processes without having the possibility to attract new markets could be a disadvantage for Speedline. However, demand for alloy wheels should be very strong for automotive companies.

Literature tell us that there are many typologies of stakeholder engagement. The interviewee manager of the company answered to the question related stakeholder engagement in this way: "*Yes, but partially. Suppliers in the automotive industry are pushing for the implementation of carbon reduction*"[19]. The relevance of stakeholder engagement is linked only to the stakeholder operating in the same sector. This is because they have to follow the same environmental policy.

Companies can communicate their environmental performance in various forms. There are many voluntarily guidelines and standards report like Corporate Sustainability Report, GRI report or the International Integrated Reporting. Another way to disclosure is by participating at the Carbon Disclosure Project. Speedline has not the requirement to apply a mandatory non-financial report. Currently they do not use any of them. But, according to the manager, they probably will disclosure a sustainable report in the future. Concerning the CDP, the decision to adhere is up to the leading group and the manager of Speedline does not know whether they have been joined or not. However, Speedline has some environmental certifications to comply with. Speedline manager said: *"Yes, minimum requirements for our business are ISO 14001 and 9001 certification. Moreover, we have the IATF 16949, which is based on and integrates ISO 9001, which in turn is mandatory in our sector. We also have the AIA authorization used to comply with the European IPPC directives"*[20]. For the moment, Speedline has only those certifications which are mandatory for its business.

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[19] *Si, in parte. I fornitori della catena automotive spingono l'implementazione della riduzione del carbon.*
[20] *Si, i requisiti minimi per la nostra attività sono la certificazione ISO 14001 e la 9001. Inoltre abbiamo anche la IATF 16949 che si basa e si aggiunge alla ISO 9001. che è aggiuntiva alla*

Environmental political activities are regulated by standards imposed by the European union according to the firm characteristics and the sector in which it operates. As already mentioned, Speedline is obliged to undertake environmental policies by following specific standards. Any funds at European or Italian level are for the implementation of such policies are planned. Speedline stands out for the implementation of voluntarily and internal environmental policies. The main is example is those related to the Planblue project. Speedline approach over environmental policies of its stakeholders is described by the manager in this way: *"We are not very invasive in requiring external companies their environmental policies"*[21]. Speedline has its own environmental performance evaluation which is in part imposed by standards and partially imposed by Ronal Group.

9001 che è obbligatorio nel nostro settore. Disponiamo anche dell'autorizzazione AIA la quale serve per uniformarsi alle direttive europee IPPC.

[21] *Noi non siamo molto invasivi nel richiedere alle aziende esterne le loro politiche ambientali.*

CHAPTER 5

CONCLUSIONS

To investigate how a company mitigates carbon emission, as a precondition, a general overview concerning climate change dynamics was outlined. After that, many environmental initiatives at international and national level to spread awareness over this topic have been described. It has been proposed a theoretical framework about corporate carbon strategy in response to external environmental policies. Based on such theoretical framework, a case study has been selected. Once defined the corporate carbon strategy of Speedline, some outcomes are outlined. The ultimate scope is to identify the main determinants affecting carbon reduction performance of a non-listed company operating in the mechanical engineering sector and situated in the Venice county, an area with an increased environmental sensitivity.

Conducting a sustainable activity could affect negatively or positively the economic performance. Such influence should be estimated according to the available tools that a company has. The manager of Speedline described the approach of its company in evaluating costs due to the implementation of environmental strategy. He pointed out: *"We control emissions yearly; this operation entails costs arising from the burner control and from the control of refrigeration system losses. We should make the FGAS declaration once a year. For example, we have some greenhouse gases such as the hydrofluorin carbide and gases that are responsible for the ozone hole such as hydrocloro carbide"*[22]. F-gas is a European regulation which has been applied since 2015. It aims at limiting the total amount of gas emission by banning the usage of certain gasses and by preventing gas emission (European Commission, 2015). To the question whether Speedline converts environmental costs in financial one, the answer of

[22] *Noi facciamo il controllo delle emissioni annualmente in genere, tale controllo comporta dei costi, costi derivanti dal controllo bruciatori, costi per il controllo perdite impianti refrigerazione. Dobbiamo fare la dichiarazione FGAS una volta l'anno. Ad esempio, abbiamo dei gas effetto serra come il idrofluoro carburo e gas che sono responsabili del buco dell'ozono come l'idrocloro carburo*

the manager was: "*they are simply accounted as operating costs, because we do not disclose an environmental balance sheet*"[23]. This company applies a precise analysis of carbon emission and energy consumption, but they have not yet identified specifically environmental costs. Speedline does not compare financial costs with environmental costs when they buy specific resources like equipment. So, any trade-off is made in comparing expensive but sustainable equipment with those that are cheap but pollutants. Precisely, their equipment are BATs. Best Available Techniques are technologies approved by the IPPC Directive (2008/1/EC) (European Commission, 2016). However, the manager of Speedline underlined the importance of minimizing costs which lead to a competitive advantage. He explained: *"because choosing the best technologies lead to an economic advantage as they involve less energy costs. We have to fulfil the requirements of the certifications, but we aim to obtain an advantage in the long term, which exists, but it is difficult to quantify it"*[24]. Speedline thinks that investing in well performing equipment will reduce costs in the long term. The issue of combining short term profit target with long term goal of environmental mitigation is not relevant for Speedline. The manager stated: *"In our case, being obliged to fulfil the requirements of environmental certifications and targets by the leading group (see 50% reduction by 2030)"*[25]. they do not have to complain with such trade off.

To answer the research question: how does Speedline apply its carbon strategy, I have summarized and interpret data obtained from the interview. The corporate carbon strategy of Speedline consists mainly in minimising consumption in the production process by exploiting the physical properties of aluminium which could be recycled forever. The key requirement for this strategy is the use of specific and suited equipment in the production process, namely the use of BATs. The implementation of several targets is imposed by the headquarter Ronal Group to its branches in terms of carbon reduction performance. Notwithstanding the binding of environmental regulations, Speedline

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[23] *semplicemente sono contabilizzati come costi di gestione, perché non pubblichiamo un bilancio ambientale.*
[24] *perché scegliendo le migliori tecnologie si ha un vantaggio economico in quanto comportano meno costi energetici. Noi dobbiamo adempiere alle esigenze delle certificazioni, ma cerchiamo di ottenere un vantaggio nel lungo periodo che c'è, ma è difficile da quantificare*
[25] *Nel nostro caso, essendo obbligati ad adempiere alle esigenze delle certificazioni ambientali e ai target da parte della capogruppo (vedi riduzione 50% entro 2030)*

demonstrates it willingness to reduce carbon emission through the implementation of the project Planblue. The Bike2RONAL initiative is a practical example in which company's culture contributes in reducing carbon emission. According to the SMEHS manager, carbon performance affects positively Speedline's economic condition. However, given the current organisational structure of the company and the lack of sustainable reports, it is not yet possible to estimate the economic performance in relation to its environmental activity.

According to the information obtained and based on the definition of Speedline's carbon strategy, I have identified the main determinants affecting such corporate carbon strategy. The main external driver which has been strongly enhancing environmental performance of Speedline is institutional pressure. Indeed, governments at European and Italian level oblige Speedline the company to reduce carbon emission because of the sector to which it belongs. Thanks to external regulation, the process of production and products are characterised by low carbon emission. However, external stakeholders affect in a good manner the environmental performance of the company too. Because of external regulation affecting the whole industry, external stakeholders' pressure, exercised by supplier and customers, contribute to improve Speedline's carbon emission performance.

Internal drivers are affecting Speedline carbon strategy too. They can be identified in: employees' commitment, waste reduction, quality improvement, and top management support. In particular, corporate governance affect positively corporate culture. Speedline's culture involves all the internal members, involving every employee with in corporate carbon strategy implementation. This result is reached thanks to the Planblue project implemented by Ronal Group. Under internal guidelines, Speedline minimizes waste in an efficient manner. To highlight the internal willingness to mitigate carbon emission, Ronal Group project aims at reducing carbon emission of 50% by 2030. The corporate carbon strategy of Speedline focuses on carbon reduction through the usage of BATs equipment and by minimizing the energy consumption. Notwithstanding institutional pressure which has been impacting Speedline activity in a significative manner, the implemented strategy has been improving the economic trend. The unique limit relies on the fact that Speedline has not yet the tools to quantify such linkage between environmental and

financial performance. However, Speedline thanks to the support of its leading group is responding with an efficient strategy considering such regulation constraints.

Considering the industry and the area investigated, European and Italian legislations influence significantly the mechanical engineering industry. Based on this type of investigation, European and Italian policies represent the main driver for the implementation of corporate carbon strategies. The hierarchical organisational structure of the investigated company (Speedline), which is based on a top-down approach, allows the implementation of external rules. At the same time, Speedline's informal communication is effective for the governance of the its internal sustainable activity.

The strength of this research concerns the unique case study investigated. In particular, the fact the company belongs to an environmental sensitive industry and the many environmental initiatives developed both because of external regulatory pressure and internal stakeholders and corporate governance engagement. Further, I had the opportunity to visit the company and to interact with the environmental responsible. Through the questionnaire, information concerning plans adopted by the company is motivated. Since there are not yet studies identifying how a company applies a corporate carbon strategy, I made this type of research relying on a qualitative approach. This investigation is was made by applying Damert *et al* (2019) corporate strategy framework. While Damert *et al* study, based on a quantitative investigation, focuses on secondary data, my research relies on primary data. Secondary data concerns just the analysis and interpretations of primary data. Hence, the value added of my research concerns the quality of information obtained. In order to apply Damert et al (2017) corporate strategy framework to my qualitative analysis, I found and used many theories related to such framework.

Through this qualitative investigation, the aim was to describe in deep how corporate carbon strategy is implemented by a company within a specific environmental sensitive sector at European context. For this reason, the main limit of this research is the difficulty of generalizability of results. Indeed, the approach adopted is not fitted with the inductive reasoning principle. Despite the fact that even more companies are starting to implement and disclose initiatives to reduce carbon emission, especially in the investigated area, it is currently

impossible to formulate a general corporate carbon strategy suitable for every companies.

Further research is required to quantify the environmental costs within a sustainable company in the mechanical engineering industry in order to evaluate whether environmental sustainability may lead to financial competitive advantage and economic sustainability in the long term. Moreover, a further investigation should be to analyse corporate carbon strategy framework of companies belonging to other industries in order to highlight differences and similarities.

Speedline's strengths in reducing carbon emission are its functional structure which allows the implementation of external regulations and, at the same time, its internal informal communication that facilitates carbon emission governance. The results, is that they have been reducing carbon emission and energy consumption in an efficient manner without compromising their business activity. The weakness stems from the fact that Speedline is not yet able to quantify environmental costs and that has not all the tools to disclosure their environmental performance. For the improvement of their carbon emission performance. Speedline may start disclosing about its carbon reduction initiative into non-financial report by adhering to authoritative guidelines such as those of the Global Reporting Initiative or those of the Integrated reporting. In this way, Speedline has the possibility and the tools to identify environmental costs. Once outlined environmental costs, it is easier minimize them and gaining economic advantage. Furthermore, Speedline may to adhere with the Carbon Disclosure Project, since the company focuses strongly on carbon reduction. This international project provides tips obtained from other companies (which in turn have already adhered to), to enhance carbon reduction performance. In other words, disclosing through CDP, allows the exchange of information among companies regarding carbon reduction strategies. By disclosing through non-financial reports and the CDP, Speedline's external stakeholders will have a clearer idea about its business culture and performance. This will also in turn a further improvement of company's reputation.

APPENDIX

QUESTIONNAIRE: SPEEDLINE & SAN BENEDETTO

1) ACTIVITY DESCRIPTION

1A. QUESTION FOR THE MANAGER: What role do you play in the company?
1B. How long have you been working for this company?
2A. What is the main business of your company?
3A. Is the business characterised by the use of sustainable products or processes?

2) THE COMPANY'S HIERARCHICAL STRUCTURE

4A. What is the organisational structure of the company (functional, divisional, multi-directional, matrix)? **4B.** Is it possible to view the organisational chart?
5A. Is communication within your structure bottom-up and/or top-down?
6A. What is the size of the company where you work?
7A. Do you think your company's size affects the approach to the environment?
7B. If yes, how?
8A. Is there a specific person within the company that is responsible/accountable for environmental management? **8B.** Is CSR role present in your company?

3) CORPORATE CARBON STRATEGY

9A. When the interest in the environmental aspect within the company started and for what reason?
10A. Do you think companies sensitive to environmental conditions can positively affect climate change?
11A. What is the company's reaction to the environmental issue? **11B.** Which company strategy do you adopt to mitigate pollution, in particular CO2 emissions?
12A. Do you think CO2 emissions represent the primary source of pollution in a business context?

CARBON GOVERNANCE

13A. In your opinion, informal internal communication (based on the interaction of the different knowledge/experiences of those involved with the environmental issue)- related to environmental projects/issues- differs from the formal one? **13B.** If so, how? **13C.** Do you think it is effective?
14A. How does internal informal communication take place with regard to the environmental aspect? **14B.** Do you hold meetings or projects about that?

Organisational Involvement

15A. Within the informal communication channels, are all people in the company involved? **15B.** If so, are the interactions frequent (how much?) or less frequent (how often)?
16A. In your opinion, does informal communication make the recognising and measuring of environmental costs more efficient and effective? **16B.** Is the discussion between more people within the company regarding the resolution of environmental problems better than any unilateral decisions taken by a single company?
17A. Within the decision-making process, do you encounter any organisational difficulties in solving environmental problems? **17B.** Do company's employees play an active role in the implementation of your pollution reduction initiatives?
18A. What are the roles within the company that hold the responsibility for environmental management, and in particular for issues related to CO2 emissions?
19A. Do you need some specialist in order to implement your (environmental) projects? **19B.** Or do you employ more internal employees?
20A. Do you provide specific training courses? How do you influence corporate culture on these issues? **20B.** For example, do you provide remuneration for those involved in environmental management? **20C.** Or in general to all?
21A. Are there any awards or penalties for reaching your environmental targets?

Risk Management

22A. Do you agree with the following: "environmental concerns represent a risk to be mitigated but also entail growth opportunities for the company"? **22B.** What about your image?
23A. How do you manage risks arising from the use of natural resources?
24A. The growing awareness towards environmental issues has led to changes in consumer needs. **24B.** In your industry, did you perceive a change in consumer demand?
25A. Has your client base put pressure on your choice to protect the environment? **25B.** If yes, have you benefited from it or have you found disadvantages?

CARBON REDUCTION

Carbon Measurement & Policy

26A. How do you monitor the greenhouse gas emissions produced by your company? **26B.** Do you adopt specific techniques?
27A. Have you set target targets for reducing resource waste? **27B**. Or was it something imposed from the outside?
28A. To quantify waste reduction, do you calculate carbon footprint or do you use the Life Cycle Sustainable Assessment or Environmental Life Cycle Costing?

Products Improvements

29A. Have you joined, or are you going to join particular projects related to product improvement and involving a CO2 reduction?
30A. Are there performance indicators that measure the environmental impact of the products, the production process and possibly also the recycling of waste?
30B. If yes, who is in charge to implement such performance indicators?
31A. If you recycle waste, how do you do it?
32A. Is your packaging made of recycled material? **32B.** Or is it characterised by low-emitting materials in any case?
33A. Do you use a hierarchical scale to classify any harmful elements?
34A. Do you have products potentially more polluting than others?

35A. Who deals with the detection of harmful elements and their classification?
36A. How often do you detect harmful elements?

Process Improvements

37A. In order to reduce C02 emissions, did you have to renew your production process? **37B.** Have you also changed the way your logistics work?
38A. Do you select suppliers based on the environmental impact they have? **38B.** What is your approach to your supply chain? **38C.** Do you make a selection of your stakeholders in general considering your environmental policy and are they involved in your project?

Carbon Compensation

39A. Do you identify areas where it is impossible to reduce the emission of C02?
39B. Have you ever purchased "credit carbon" in order to still be able to maintain these polluting activities? (see EU (ETS) Emission Trading System O KYOTO MECHANISMS)

CARBON COMPETITIVENESS

New Markets & Product Development

40A. Do you invest in R&D in order to produce environmentally sustainable products and/or services? **40B.** Did you also carry out process innovations to pollute less?
41A. Thanks to the investment in developing more sustainable products/processes, did you enter/create new markets?

Stakeholder Engagement

42A. Are your stakeholders involved in planning your environmental strategy? **42B.** What about the implementation? **42C.** What about their control in what you did?

Corporate Communications

43A. Through which channels do you communicate your results in terms of environmental performance?
44A. Are you taking part or thinking of engage in the Carbon Disclosure Project?
45A. Do your financial statements take environmental aspects into account? **45B.** Do you produce a sustainability report? **45C.** Have you ever thought of preparing the financial statements according to IIRC principles on Integrated Reporting?

Political Activities

46A. Is there any specific requirement for environmental certifications in your industry?
47A. Are there any legal or administrative requirements to undertake an environmental policy within the company?
48A. Are funds granted at the community or national level for adopting certain environmental policies? **48B.** If so, do you receive them?
49A. Do you have particular initiatives related to environmental issues? **49B.** Do you share these initiatives with other organisations or have you created them?
50A. Would you have recommendations to suggest at a political level for implementing policies to reduce CO_2 by companies?

ECONOMIC ADVANTAGES/DISADVANTAGES deriving from the adoption of policies related to the environment:

51A. Do you track environmental costs? **51B.** That is, do you identify and quantify environmental costs, distinguishing them from those of a financial nature? **51C.** Who is in charge of measuring these costs?
52A. Are these costs translated in economic terms? **52B.** If so, how? **52C.** Are they also communicated externally? **52D.** If so, why? Is it not a sensitive information?
53A. When taking decisions, how do you weigh financial costs and environmental costs? **53B.** That is, if you were to opt for a less expensive but more polluting resource or for a resource that is less polluting and more

expensive, what would be your first choice? **53C.** Do you have specific criteria to address these decision-making processes? **53D.** Do you adopt a sort of mapping?

54A. Given that you are a sustainable development-oriented company, do you think that the identification and optimisation of environmental costs represents an effective economic advantage?

55A. How do you measure the possible economic advantage deriving from your environmental choices?

56A. Are the benefits of environmental management short-term or long-term oriented?

57A. How do you reconcile short-term profit objectives with long-term environmental impact mitigation objectives?

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