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"ARE COMPANIES USING WATER DISCLOSURE TOWARD SUSTAINABLE DEVELOPMENT GOAL 6? AN ANALYSIS OF TWO WATER-INTENSIVE SECTORS"

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Firma dello studente

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INTRODUCTION

Nowadays, financial data provided by the companies in order to fulfil their legal requirements are not more enough in order to satisfy the requests of stakeholders and possible new investors. For this reason, companies are using a new tool in order to match their needs: voluntary disclosure. This kind of information could have different forms, but one of the most adopted is sustainability reporting. This is the practice of disclosing information regarding the attitudes, policies and performance within the context of environmental and social data near to the classic financial statements.

One of the issues of sustainability that is getting more and more interest is the theme of water, which is fundamental in order to survive. At the same time, the availability of the resource is not ensured in all the regions of the world: in particular, there are developing countries which are experiencing a tough situation of water scarcity that is not only threatening the possibility to survive but has also economic implications. Without that resource people could more easily get sick or die and this means lower labour force and so a barrier to the possibilities of development of the economic situation of the country. Moreover, there are entire industries that without water could not be made and between them agriculture is most important one. Developing countries highly rely on the exportation of their cultivations, so for them the availability of water is of fundamental importance. For this reason also other industries that are water intensive need to become more efficient in their use of water and must take into account issues that derives from the area in which there are conducting their operations. When in 2015 the United Nations developed a set of goals that should ensure a level of development that is sustainable over time, one of them was entirely devoted to the water issue. This one was the Sustainable Development Goal 6, which aims to ensure water and sanitation to all.

The goal of the analysis is to analyse how to water-intensive industries address their disclosure regarding the theme and in particular to understand if the objectives of Sustainable Development Goal 6 fit into this type of information. The document is articulated as follows: the first chapter is devoted to understand the concept of sustainability and the practise of sustainability reporting. This topic was not free of critics and the last paragraph of the first chapter is entirely dedicated to this issue. Then, the second chapter enters into the details of the water issue, starting from the analysis of the problem of water scarcity looked at a global level. Then in the chapter the theme of Sustainable Development Goals is addressed to the water problem. The chapter is concluded by a review of the literature regarding water accounting and water disclosure with special insight devoted to the “Corporate Water

Disclosure Guidelines" published by the CEO Water Mandate. Inside the third chapter it is descripted the research method used to conduct the analysis and in the fourth the results are presented and discussed. The chapter is ended with the conclusions that can be drawn from the analysis made.

CHAPTER 1

WHAT IS SUSTAINABILITY?

1.1 A LONG PATH TOWARD THE SUSTAINABILITY CONCEPT

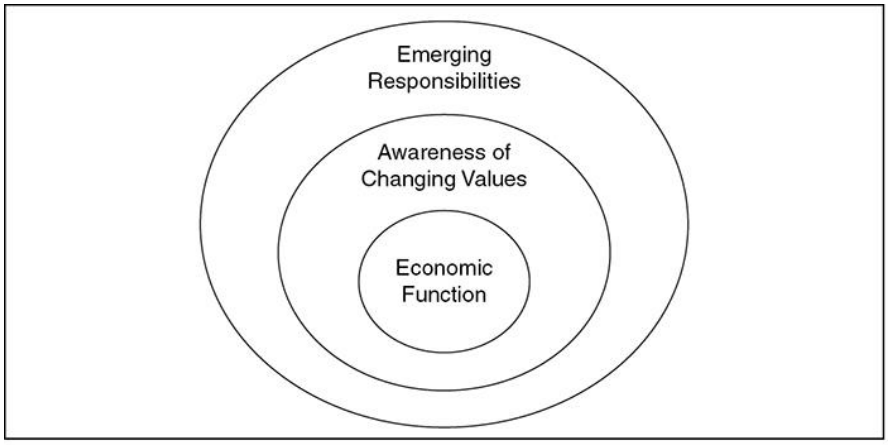
While the concept of sustainability is far more recent, the idea that companies must go beyond the pure economic side of business emerged in the middle of the 20th century. In 1953, Bowen theorized its ideas in the book "Social Responsibility of the Businessman", in which he identified the important role that companies play in the society in which they operate and their power to influence the social environment through their actions. Bowen (1953) highlighted the relevance of social responsibility of businessmen, and in particular that they should not break societal values when taking decisions or setting their goals. According to the author, businessmen should not just satisfy the needs of shareholders but should behave in respect of the values of the whole society. In the 1960s the theme of corporate social responsibility became the centre of the interests of many researchers. In 1960, Davis defined CSR as "business-men's decisions and actions taken for reasons at least partially beyond the firm's direct economic or technical interest". He was the first to sustain the thesis that business decisions in accordance with socially accepted values could be justified in the long run by a higher gain for the company, paying back the sacrifices incurred to be responsible. Frederick (1960) stated that "the economy's means of production should be employed in such a way that production and distribution should enhance total socio-economic welfare". Another important contribution of Frederick in its book, was the claim that companies should use economic and human resources in a respectful meaning and use them not only in the interest of the company and shareholders but for the goals of the broad society. In 1966, Davis and Blomstrom argued that only businessmen that consider that the interests and the needs of other people could be influenced by the actions of the firm could be defined as socially responsible.

A further step toward the definition of corporate social responsibility was given by the studies of Johnson. For the first time, in 1971, in its book "Business in Contemporary Society: Framework and Issues", he took into account the interests of stakeholders. Johnson proposed 4 different views to CSR. In the first one he stated that according to Corporate Social Responsibility managers have to balance between the interests of many parts and not only the ones of shareholders. The second one looked at social responsibility just as the maximization of the profits in the long run. The third one presented social responsibility as utility

maximization, recognizing that the goal of companies is broader than just profits. According to the fourth one, instead, the most strongly profit-motivated firms could adopt socially responsible behaviour once they have reached their profit targets, as if being socially responsible was one of their most important objectives. Postulating the four definitions, the author said that, even if they could seem like contradictory between themselves, they are complementary views of the same thing.

Another important contribution toward the definition of SCR was given by the Committee for Economic Development (CED), when, in 1971, published the text "Social Responsibilities of Business Corporation". The publication highlighted the changes in the expectations between corporations and society. Companies were asked to respect human values and to take broader responsibilities than before, they were expected to do more than just provide products and services to the society. The way in which organizations conduct their activities became as important as the product/service itself. In the book there was developed a three circles model to define CSR (figure 1.1). The central circle represents the basic responsibilities of a profitable conduction of its economic function. The middle circle stands for the responsibilities that a company should take in doing its economic function, taking into account the evolution of values and priorities in the society around it. The external circle includes emerging responsibilities that the firm should take in order to be involved in the improvement of social environment.

Figure 1.1 Three circles model of CSR

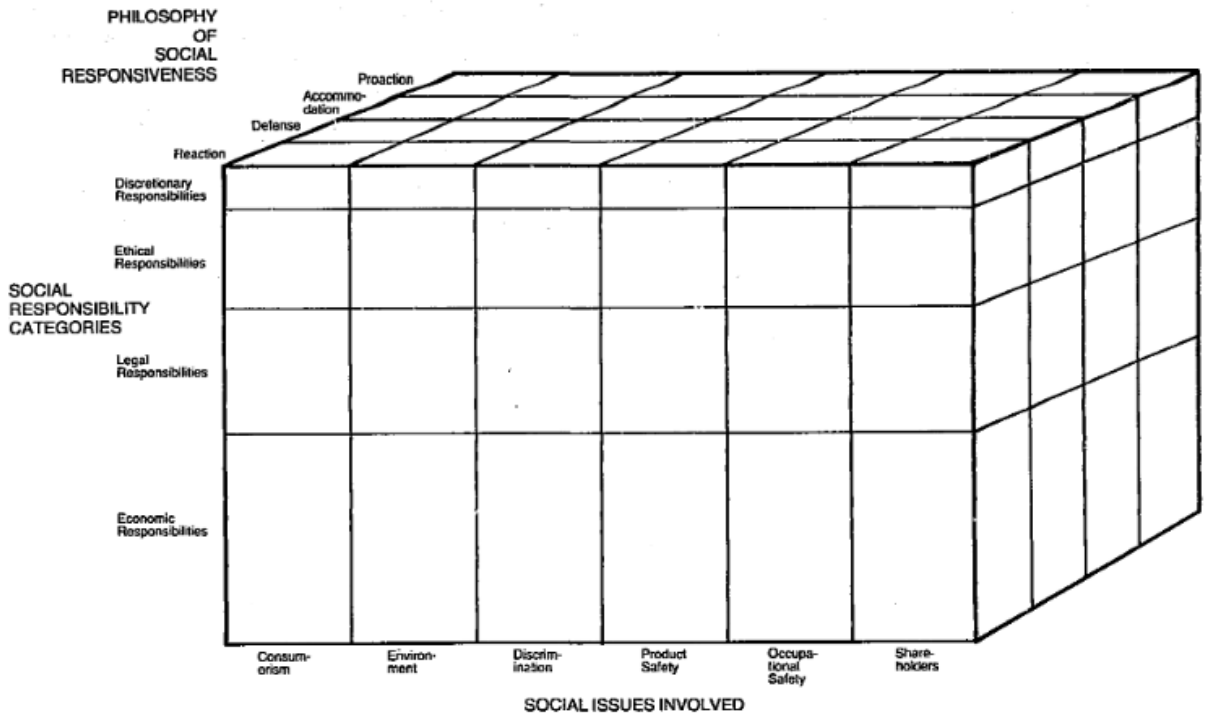


Source: Adapted from Committee for Economic Development. 1971. *Social Responsibilities for Business Corporations.* New York: Author; and Blomstrom, R. L. 1971. *Business, Society, and Environment: Social Power and Social Response* (2nd *ed.*), New York: McGraw-Hill Book Company.

In 1979, Carroll, starting from this three-dimensional model, elaborated a four categories structure of CSR. Those are economic, legal, ethical, and discretionary. The basic role of business is to provide products and services to the whole society in an efficient way, so the economic responsibilities should be a fundamental starting point. The second category is the legal one, which implies that firms, pursuing their goal, must respect the legal framework of

the society in which they operate. The third class includes those set of values that are not codified into law but not for this reason are less important. Society expected companies to respect more than just legal requirements in their activity. The last set of responsibilities are the ones called discretionary. To this category belong all the voluntary roles to which a business decides to commit itself even if the society have not expectation on that field. This kind of responsibilities reflect spontaneous choices of the firm. Moreover, the author in the book introduced the concept of corporate social performance (CSP). CSP goes beyond the simple identification of responsibilities and is made up of 3 components: Corporate Social Responsibility, Corporate Social Responsiveness and Corporate Social Issues. The first element regards the evaluation of the four types of responsibilities previously presented. Corporate Social Issues imply a company to identify the areas and major topics to which those responsibilities belong. An important element of the model is that issues change from industry to industry and must be decided from the management. Corporate Social Responsiveness is the philosophy adopted to manage responsibilities and issues. The strategy belongs to a continuum which goes from no response to a proactive one. Carroll stated that "Corporate social performance requires that (1) a firm's social responsibilities be assessed, (2) the social issues it must address be identified, and (3) a response philosophy be chosen.". The figure below represents an example of Corporate Social Performance model.

Figure 1.2 Example of CSP model



Source: Carroll, A.B. (1979). A Three-Dimensional Conceptual Model of Corporate Performance. Academy of Management Review, Vol. 4, pp. 497-505

In 1984, Freeman was the first to develop a stakeholder approach for the management of a company. The author defined stakeholders as “any group or individual who can affect or is affected by the achievement of the organization's objectives” (Freeman, 1984, p. 46). According to the author, the fundamental assumption of stakeholder theory is the fact that the effectiveness of a company is not just evaluated through the power to satisfy its shareholders, but also every individual that have a stake in the firm. The key of the theory is that the management could handle the relationship with its stakeholders in a strategic way.

At the same time, in the 1980s the theme of the environment caught the attention of scholars. The concept of sustainability emerged for the first time in 1987, when the World Commission on Environment and Development (WCED) published the report “Our common future”. The paper is divided into three parts: common concerns, common challenges and common endeavours. The scope of the first one is to present the warning global situation and to put attention on the problems that were arising. Developed and poor countries were, in different ways, both damaging the environment. The authors used the term “threatened future” and identified 4 main causes of that situation: poverty, growth, survival, and economic crisis.

Regarding the first one, the paper highlighted that there was an increase in the number of people living in slums, or that do not have access to clean water, or in general is living in a condition that is below an acceptable level of quality. All these factors led to an increase in the diffusion of diseases that were, if possible, even worsening the living standards in countries that were in difficulty yet before. In the poorest regions, people were willing to use their resources even in inefficient ways and to destroy their environment just because they need to do that in order to survive. Developing countries’ economy relied heavily on raw materials and the exportation of their local cultivations, so ,too often, expansion could be reached only damaging the ecological equilibrium.

The second cause identified is related to the abuse of resources used to reach economic growth in industrialized countries. Those ones were experiencing huge improvements in their economic situation and arrived at a point in which their expensive living standard are reached through the inconsiderate increase in use of raw materials, source of energy, chemicals.

And strictly connected to the previous is the third cause, defined with the name survival. The increase in population and production directly implicates a subsequent need of natural resources. But in our planet those resources are limited. The document is very clear stating this with the following words: “Nature is bountiful, but it is also fragile and finely balanced. There are thresholds that cannot be crossed without endangering the basic integrity of the system. Today we are close to many of these thresholds; we must be ever mindful of the risk

of endangering the survival of life on Earth.". Problems like greenhouse effect or desertification or air pollutants could not be forgotten.

Lastly, the fourth cause is economic crisis. When the paper was written the world was experiencing a period of slow economic growth during the 80's. That situation has the worst effects on the poorest countries that were respond with an overexploitation of natural resources in order to face the short-term difficulties. And this environmental degradation in the future could be a threat the possibility to improve the situation of these countries.

The main message that came out from this analysis of the situation that the world was experiencing during that period is the need of sustainable development. It is defined as the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The most important parts of the definition are two: the concept of needs, which are, first of all, the ones of the poorest countries, and the limitations that social organization and state of technology imposed to the ability to reach those needs for present and future generations.

The text, also, proposed a list of objectives in order to reach a sustainable development.

The first one is "Revive growth", which basically means that in order to satisfy the need of a growing number of people that live in condition of poverty a minimum level of growth is needed. As said before poverty reduces a sustainable use of resources so a certain level of growth is needed to arrive also in poorest countries. So, it is not only important a minimum level of global growth, but it is necessary that this involves the developing countries. It is there that it helps the most.

The second goal is "Changing the quality of growth". This adds another challenge to countries: the activities in which this level of improvement is reached should be less material-intensive and energy-intensive in order to control the use of natural resources and to be less subject to economic crises. This also implies that companies when evaluating the costs for their activities should take into account the deterioration in the level of resources that they are causing. Moreover, it is important that also non-economic variables are considered, in order to incorporate the impact on the social environment, to promote social inclusion and parity.

The third goal recalls the definition of sustainable development and is "Meeting essential human needs". As said before, the use of the word "needs" started from the ones of the poorest countries. Those that are considered to be essential are the one of employment, availability of food and water, housing, energy, and health care.

The fourth objective is "Ensuring a sustainable level of population". This means that, to have a sustainable development, it is needed to maintain a level of population adequate to the

ability to which it could be carried on through the productive system. Practically, it is necessary to promote policies that help developing countries to control the level of births.

The fifth goal is “Conserving and enhancing the resource base”. As the definition says, future generation should have the possibility to satisfy their needs, so it is imperative that natural resources must be preserved. The most critical task regarding this point is the preservation of air and water, reducing the level of pollution in both. In particular, the attention should be put on the fact that it is fundamental to prevent and anticipate future problems before that the situation is irreversibly compromised. This has practical implications in the policies that should manage the level of consumption, particularly in industrial countries. It is the lack of alternatives that put more emphasis on resources, so it is responsibility of the governments to adopt policies that increase the range of options that people have to satisfy an acceptable quality of life. More importance should be given to the conservation of agricultural lands and fishery and forestry resources, since they are source of essential needs and, in many parts of the world, they already reached a level of overexploitation. But the most important limit that threat development is the scarcity of sources of energy and the ability of the planet to absorb the by-products derived from the use of them. For this reason, it is important to shift to renewable sources of energy and to conserve and use energy in efficient ways. The increase in population put even more importance to this objective and make it more challenging.

The sixth goal is “Reorienting technology and managing risk”. Technology is described as the link between people and nature. So, this objective has two different declinations. First of all, bringing technological innovation in developing countries in order to allow them to use it to enhance a sustainable development. Usually, technology that is developed in industrialized countries is not easily adaptable to developing countries. This mainly for different scenarios in terms of socio-economic reasons or environmental ones. Secondly, it is necessary to bring environmental concerns when developing new technology. This is closely related with the theme of risk management. It is important to take into account the potential impacts that the technology could have on the environment before that this innovation is used. This will allow to prevent damages that could occur due to a failure or the problem that the repeated use of the technology lead to a situation of overstress regarding natural resources.

The seventh and last objective is “Merging environment and economics in decision making”. This is the objective that sum up the whole philosophy that is behind the concept of sustainable development. When making decision it is necessary not only to incorporate economic elements but to take also into account ecological factors. This is not an easy task since it involves a change in policies and attitudes al many levels. Too many times the economic interest of one or more social groups prevailed in the decision-making process in

front of environmental issues and without taking into account any potential drawback that other people could face. Another mistake that should be avoided when deciding policies is the fragmentation of industry or sectors, failing to get the interconnection between them regarding environmental or economic issues. Sustainability requires this division to be overcome and to adequate the set of responsibilities to reflect an institutional infrastructure in which common interest is enforced.

Even if the paper was published in the late '80s many of the themes presented are now as actual as they were that time. These objectives to reach sustainability, highlight the multidimensional characteristics of the concept.

Starting from the publication of this report, the theme of sustainability immediately got the attention of the United Nation and in 1989, with a resolution of the United Nations General Assembly (UNGA), a meeting was convoked. The conference was held in Rio De Janeiro in 1992 and took the name of "United Nations Conference on Environment and Development" (UNCED), also known as "The Earth Summit". It was the biggest conference in terms of number of participants, with 183 countries represented. The main theme was the relationship between environment and socio-economic development and the meeting ended with the signing of 3 documents, "The Rio Declaration", "Forest Principles", "Agenda 21", and 2 treaties, "Convention on Climate Change" and "Convention on Biodiversity".

The Rio Declaration stated rights and responsibilities that every country has in relation with the objectives of the meeting. It is composed of 27 principles that are developed to create a global approach toward sustainability. The first principle declares: "Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature". Principle 3 recalls the definition of sustainability that was used in 1987 and says: "The right to development must be fulfilled so as to equitable meet developmental and environmental needs of present and future generations". Other important concepts are expressed in principle 5 (dedicated to the priority to fight poverty), principle 20 (related to the importance of an active role of women in societies), and principle 25 (devoted to put a direct link between peace, development and the defence of the environment). It is easy to see how many of these concepts derived from the seven objectives expressed in 1987.

The Forest Principles is a non-legally binding document used to give advices for a sustainable conservation and development of forests. The agreement to write the paper was not easy to find because of strong differences that emerged between developed and developing countries. The final document was a compromise. The importance of this treaty lies in the fact that for the first time forests are recognized to be not only critical for the equilibrium of the environment, but also for economic reasons.

Agenda 21 is the document that include an action plan at a global level, studied in order to face the challenges that the new century would have presented. It is non-binding legally but one of the most important feature is that, to reach sustainable development, every country has to do its part. When discussing this action plan countries strengthen the fact that the only way in which development could be feasible is by the integration of environmental concerns inside it. And this goal could be reached only with a global collaboration and commitment toward common principles. There is not a country that could reach sustainability alone. The plan is detailed in policies to adopt and actions to do in order to fight poverty, protect the natural biosphere, prevent deforestation, and promote sustainable agriculture. The plan aimed to intervene in every area in which human beings could influence the environment. The paper is divided into 4 sections: "social and economic dimensions", "conservation and management of resources for development", "strengthening the role of major groups" and "means of implementations". In the last part of the document, there is, in particular, an attempt to quantify an amount of resources that should flow from developed to developing countries. This help could have the effect to maintain an acceptable level of natural resources instead of overexploiting them in those countries and to compensate them for the earning that they would have got from those resources. The aid was established with an amount of 0,7% of its gross national income that every industrialized country has to give to the Official Development Aid (ODA). Starting from the publication of this plan, UN had regular meeting to check the level of implementation of the plan and to correct and implement features.

The 2 conventions are the only legally-binding results of UNCED. The first one is the "United Nations Framework Convention on Climate Change", which focus was on the problems that arise from climate changes. In particular, the document posed the protection of the environment as a global goal and highlighted the need to reduce greenhouse emissions. The document did not impose a strict plan that everyone has to follow but it was a commitment that every country assumed toward the common objective. The agreement specified that every country committed itself to promote the knowledge regarding greenhouse gas and the effects that these have on the environment and then to stabilize and reduce them. The pattern could not be the same for industrialized and developing countries and regarding this point Article 4 states in paragraph 7: "The extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology and will take fully into account that economic and social development and poverty eradication are the first and overriding priorities of the developing country Parties". With the treaty, countries agreed to meet

annually to assess progresses made. These annual meetings took the name of Conference of Parties (COP) and were held since 1995. These meetings led in 1997 to the Kyoto Protocol, an international treaty which implemented the new goal of reducing global warming through the reduction of greenhouse gas concentrations. The agreement became effective in 2005, after that Russia ratified it at the end of 2004. Protocol's first commitment was related to the period between 2008 and 2012, during which, countries had to reduces their emissions of greenhouse gas emissions in percentage of the value that they had in 1990, took as base year for almost every country. The goal was to reduce it with a percentage that on average was 5%. In 2012, with the agreement of Doha, the Protocol was prolonged up to 2020, with new targets.

The second legally binding document signed during UNCED is the "Convention on Biological Diversity". Effective from the end of 1993, the goal of the treaty was to encourage national policies that will protect the biological diversity and made a sustainable use of them and to develop a fair sharing of the benefits that arise from genetic resources. The United States are the only country among UN members which did not ratified the agreement.

In 1997, John Elkington published his book "Cannibals with Forks: The Triple Bottom Line of 21st Century Business", which introduced the definition of Triple Bottom Line. It is the most used concept to present what sustainability is and reflected the values that were presented in the paper mentioned before. Usually nowadays the concept of Triple Bottom Line is used as synonym of sustainability. This model divided the concept of sustainability into three parts, Planet, People and Profit which represent literally the environmental, the social equity and economic sides of sustainability.

The social equity bottom line is related to taking into account the positive and negative impacts that corporations' activities have on the life of its stakeholders.

The environmental bottom line considers the impact of the activities on the planet.

The economic bottom line takes into account the economic impact of the corporation on the society in which it operates. This third side is the one that most frequently is misinterpreted: it is not just focusing on the financial result of the activities carried on by the corporation but is related to the whole society. It is societal profit.

According to this principle a corporation should aim not only at maximizing the value for its shareholders but has to take into account the effect of its operations on planet and on the social environment of which it is part of. This view is consistent with the stakeholder theory.

In 2000 the United Nation convoked a meeting in which the heads of state discussed the role that the organization should have in the new century. The event took the name of "The Millennium Summit" and the result was the ratification of a document called "The

Millennium Declaration". The most important follow up of that event were the Millennium Development Goals (MDGs). The organization identify 8 objectives, each measured by specific targets and gives itself 15 years before assessing the results obtained. The 8 goals are: "eradicate extreme poverty and hunger", "achieve universal primary education", "promote gender equality and empower women", "reduce child mortality", "improve maternal health", "combat HIV/Aids, malaria and other diseases", "ensure environmental sustainability", ""to develop a global partnership for development".

In 2002, 10 years after the Earth Summit, the United Nations convoked a meeting to assess the implementation of the plan decided in 1992, and specifically of Agenda 21. World leaders met in Johannesburg and the event took the name of World Summit on Sustainable Development (WSSD). United States were the only country among the biggest ones that did not send a delegation to take part. What came out from the discussion was that that the fight against poverty was not so successful and that the deterioration of the environment was not stopped. Globalization that took place in the '90s played a major role in this path. One of the most negative result that emerged was the worsening of the differences between developing and developed countries. Developed countries were continuing experiencing the increase in well-being, while the poorest country had a slow-down in their economies and for that reason they were even less willing to follow strict policies in the name of the protection of the environment. The main outcome of the meeting was the Johannesburg Declaration, a plan of implementation of what decided 10 years before. One of the most important decisions took during the Summit was the formalization of the 2010 Biodiversity Target, which was elaborated the year before during the annual Conference of Parties in Gothenburg. Countries aimed to fight the decline in biodiversity and to protect it as an important value. There were developed indicators to monitor the results achieved, but in most of the countries the targets were not achieved.

In 2012, there was the third Earth Summit, held like the first one in Rio De Janeiro. The main argument of the conference where the goals set in Agenda 21 and a new assessment of their implementation. In particular, the objectives were to confirm the commitment of countries toward the common goal and to integrate the previous plan with the new challenges that arose along the previous 10 year. In fact, during the period between 2002 and 2012 there was a critical event that influenced every country: the global crisis exploded in 2008. In response to that the economic needs of countries return to be at the forefront of discussions. With this historical background, heads of state met, and the main outcome of the Summit was the document "The future we want". The most important concepts that emerged are 2: the need

for sustainable development goals and the need to empower UN Environment Programme (UNEP).

During 2015, during the United Nations Sustainable Development Summit, the General Assembly adopted the outcome document called Transforming our world: the 2030 Agenda for Sustainable Development. The paper, starting from the principles established in The Rio Declaration, tried to overcome the most important lack of Agenda 21, the absence of practical objectives and associated targets. For this reason, in the 2030 Agenda there were identified 17 Sustainable Development Goals, evolution of the MDGs. The Agenda took in the name "2030" because that year was identified as temporal deadline.

Figure 1.3 Sustainable Development Goals

Source: https://www.un.org/sustainabledevelopment/sustainable-development-goals/

Moreover, the new Agenda, among the means of implementation, highlighted the importance of the public international finance and in particular of Official Development Assistance (ODA). The commitment was confirmed like before at 0,7% of gross national income that developed countries have to devolve to developing ones.

1.2 SUSTAINABILITY REPORTING

1.2.1 VOLUNTARY DISCLOSURE

As Elfeky (2017) reported, the current historical period is characterised by an increased level of information disclosed by companies. In the 21st century, just being compliant with the mandatory disclosure requirement is usually not enough to meet the need of the external users of the documents published annually. The author reported that this is the "era of information" because of the influence that information has in every aspect of the society. In particular, information shape the investment decisions of users. Moreover, the practise of separation between ownership and management in most companies is increasing the level of information

asymmetry between the two parts. Wallace (1988) argued that financial statements alone are not enough to provide sufficient information to stakeholders and instead the could lead to an amplification of the gap between managers and stakeholders. At the same time, during the last decades there happened few financial scandals to even big companies, even if these companies were fully compliant with financial disclosure. For these reasons, Elfeky (2017) stated that there is the need for voluntary disclosure, which is the publication of information that go beyond the mandatory requirements of accounting principles. Voluntary disclosure could take many forms, types and extents.

The evolution highlighted in the previous paragraph related to the importance of sustainability, had inevitably impacted the expectations that people have regarding the disclosure of companies. Sustainable development is becoming one of the most important macroeconomic theme and stakeholders are interested not only to the flows of capitals that a company is able to generate. Principles and policies related to sustainability issues have gained an important role in the evaluation of companies. In response to this, some companies started producing standalone reports or dedicating a section in their annual report to voluntary non-financial disclosure. While the financial information allows an efficient allocation of capitals that follows a proper evaluation of risks, they do not give any information regarding risks related to investments in sustainability or they do not provide complete information regarding ethics and social aspects. A sustainability report could be described as the voluntary disclosure of social and environmental impacts to stakeholders and the society as a whole of the economic activity of the company.

1.2.2 DETERMINANTS OF NON-FINANCIAL REPORTING

The academic literature identified few elements with a positive correlation with the presence of sustainability disclosure. Firstly, there is firm's size. Many authors (Kelly, 1981; Trotman and Bradley, 1981; Belkaoui and Karpik, 1989; Cowen et al., 1987; Hackston and Milne, 1996) demonstrated this positive relationship between size and the adoption of those practises in various empirical studies. Bigger companies maintain a higher number of activities, that have a greater impact on the environment to which they belong, which leads to the involvement of the higher number of stakeholders with interest in different fields. For these reasons, they used to disclose a higher level of information (Cowen et al., 1987).

A second aspect which has been deemed to be related to CSR reporting is the industry to which the organization belongs. Dierkes and Preston (1977) found that companies that operates in sectors whose activities directly impact the environment, such as mining,

presented higher disclosure. Similarly, Kelly (1981) conducted a study in Australia that confirmed the positive correlation. In particular he found that companies who operates in primary and secondary industry end to concentrate on environmental disclosure, while the ones that are part of the tertiary industry focus their information on the interaction with the community. Patten (1991) stated that industry has the power to influence the external visibility of a company and for that reason, organization are more willing to disclose information in response to the pressure of stakeholders. On the other hand, Cowen et al. (1987) spotted that customer-oriented organizations are most probably willing to present higher disclosure in the demonstration of their commitment toward social responsibility because it could help the company in improving its image. At the same time, the authors did not find any association between corporate social disclosure and industry category in their study among US companies.

Another important relationship that have been investigated is the one with corporate profitability. Results are mixed. Bowman and Haire (1976) stated that the ability to respond to social and environmental issues is the same that is required to managers belonging to a firm that is profitable. Their empirical research highlighted a significant difference in the average return on equity between companies that used to disclose on social and environmental themes and companies that did not do that. Moreover, Heinze (1976) supported the thesis that profitability is the main element which could give to the managers the flexibility to engage in social responsibility programmes and to reveal them to stakeholders. Roberts (1992) found a positive linkage between corporate social disclosure and lagged profits. Other authors, instead, did not find any support for the relationship (Cowen et al., 1987; Belkaoui and Karpik, 1989; Patten, 1991; Davey, 1982). Neu et al. (1998) considered the quantity and not the quality of disclosure and found a negative relationship.

Other researchers analysed the relationship between corporate social disclosure and leverage. Studies have shown opposite results. From one side Jensen and Meckling (1976) found a positive correlation between the two. The main cause of this positive connection is the higher level of monitoring costs that highly leveraged companies have to face. In response to this, companies produce more disclosure in order to reduce them. On the other side, Belkaoui and Karpik (1989) in their analysis noticed a negative relation. Roberts (1992) and Wallace et al., (1994) did not observe any association between the two.

Lastly, an element whose correlation is found to be positive with corporate social disclosure is reputation. Ullmann (1985) highlighted that, since reputation is constructed on social and environmental basis, companies which produce more CSR disclosure are the ones with higher reputation. Neu et al. (1998) looked from the other perspective and stated that companies with

lower reputation would not have any consequence if they avoid corporate social disclosure. At the same time, they could use that instrument to improve their reputation even without effectively adopt more responsible actions. CSR disclosure could be used to answer the demands of companies' stakeholders and to meet their expectations (Sweeney and Coughlan, 2008). Godfrey (2005) argued that the issuance of corporate social disclosure has to respect 2 criteria to create positive reputation: it is necessary that the ethical value behind them is in line with the values of the larger community and, secondly, the adoption of this kind of reporting should not be expressively recognized just an effort to reach general favour.

1.2.3 GRI GUIDELINES

The Global Reporting Initiative (GRI) is an international non-profit organization whose aim is to promote a global knowledge about sustainability practises among companies, governments and organizations and to help them understanding and communicating their impacts on the environment and on the society in which they operate. They do so publishing and continuously updating set of guidelines that other entities could adopt in their documents. The most critical issue that emerged from the disclosure of sustainability issues is the fact that there is not a model to follow. Entities are not obliged to produce or include sustainability information in the documents, they could do spontaneously; and even if they decide to do it, there is not a model to follow, everyone could give the information that want and in the way in which he wants to do so (Milne and Gray, 2013). So even a comparison between two different companies operating in the same countries and in the same sector is difficult. GRI is working on this issue and the new version of the guidelines is willing to drive sustainability reporting toward the goal of standardizing the documents. The organization operates through the collaboration with many experts in different fields, going from consulting companies to university professors with specialization in finance and so on. This multi-stakeholder feature is fundamental for the goal of the organization since the aim is to provide guidelines applicable to every organization, which means that could be used in any sector and country.

The first version of GRI's guidelines was published in 2000, followed two years later by a new update, called G2. This text was presented in Johannesburg during the World Summit on Sustainable Development (WSSD). During that meeting the organization also gained the support of the UNEP and officially became a collaborative institution of it. This second version was the result of a process of revision that in the two years between 2000 and 2002 involved stakeholders all over the world. The goal of the guidelines was to provide a reporting tool that highlights the relation between environmental, social, and economical aspects of the

performance of the entity. During those years, the evaluation of the linkages between the three aspects among decision-making process was just at the beginning, but many times the decisions taken to improve one have side effects on the other two. The most important feature that this second version added to the previous one is the principle of compliance of the report toward the Guidelines, which implies higher levels of transparency and completeness of information to have that privileged status. A report recognized as compliant gives to the reader a higher level of trust and credibility. 11 principles have to be applied by entities when preparing their sustainability report:

1. *Transparency*, defined as "Full disclosure of the processes, procedures, and assumptions in report preparation are essential to its credibility";
2. *Inclusiveness,* described as "The reporting organization should systematically engage its stakeholders to help focus and continually enhance the quality of its report";
3. *Auditability*, specified as "Reported data and information should be recorded, compiled, analyzed, and disclosed in a way that would enable internal auditors or external assurance providers to attest to its reliability";
4. *Completeness,* described as "All information that is material to users for assessing the reporting organization's eco-nomic, environmental, and social performance should appear in the report in a manner consistent with the declared boundaries, scope, and time period";
5. *Relevance,* defined as "Relevance is the degree of importance assigned to a particular aspect, indicator, or piece of information, and represents the threshold at which information becomes significant enough to be reported";
6. *Sustainability Context,* illustrated as "The reporting organization should seek to place its performance in the larger context of ecological, social, or other limits or constraints, where such context adds significant meaning to the reported information";
7. *Accuracy,* represented as "The accuracy principle refers to achieving the degree of exactness and low margin of error in reported information necessary for users to make decisions with a high degree of confidence";
8. *Neutrality,* interpreted as "Reports should avoid bias in selection and presentation of information and should strive to provide a balanced account of the reporting organization's performance";
9. *Comparability,* defined as "The reporting organization should maintain consistency in the boundary and scope of its reports, disclose any changes, and re-state previously reported information"

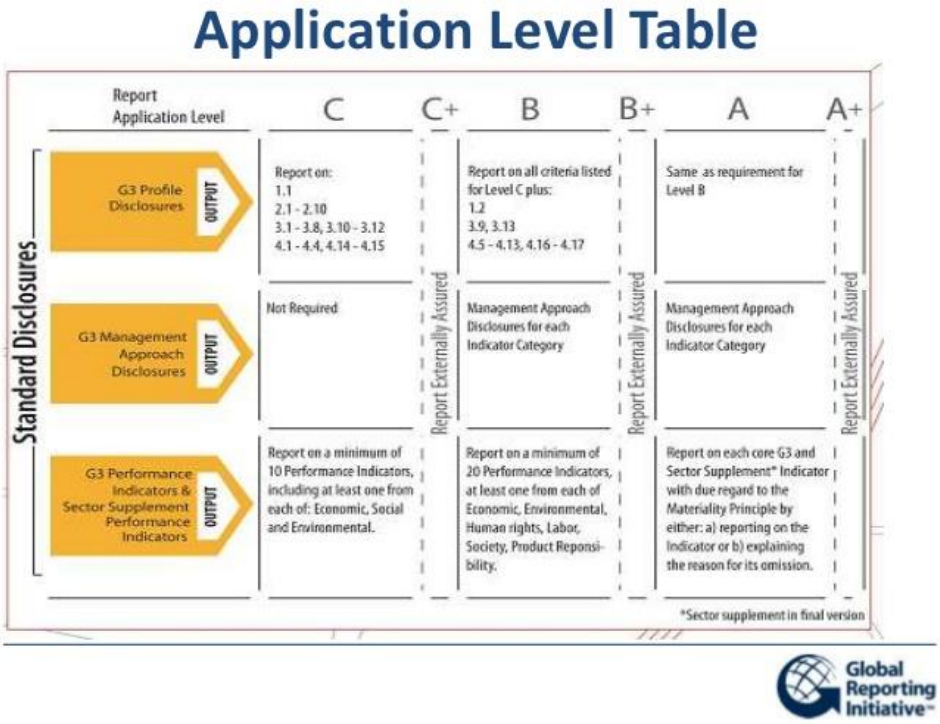
10. *Clarity,* described as “The reporting organization should remain cognizant of the diverse needs and back-grounds of its stakeholder groups and should make information available in a manner that is responsive to the maximum number of users while still maintaining a suitable level of detail”;
11. *Timeliness,* specified as “Reports should provide information on a regular schedule that meets user needs and comports with the nature of the information itself”.

Regarding the content of the report, the Guidelines indicated 5 sections. The first one is “Vision and strategy”, which implies a description of the strategy that the organization has in terms of sustainability. The second one is “Profile”, a general overview of the structure and operations of the entity, together with the scope of the report. The third section is devoted to “Governance structure and management systems”, which includes the structure of the management and the policies adopted by them. The fourth section is “GRI content index”, which is a tabular summary of where information required is located in the report. The last section is “Performance indicators”, in which there are the measures of the impact of the organization, divided between integrated, economic, environmental, and social indicators, in a hierarchical structure. Integrated ones are the only category in which indicators are not specified because of the great heterogeneity of relationships that characterized every organization. There are 2 categories: systemic indicators, which indicate the linkage between the entity and the broader economic, social and environmental system to which it belongs, and cross-cutting indicators, which are ratios that put in relation 2 or more dimensions of the three aspects of sustainability. Economic, environmental, and social indicators, instead, are divided into “core” and “additional” ones. To the first category belong “those relevant to most reporting organizations and of interest to most stakeholders”, while to the second one the ones which could be of interest of just some stakeholders.

In 2006 GRI published the third version of the guidelines, called G3. This update integrates the previous version with Sector Supplements, which gave additional instructions for specific sectors. Principles that must be used writing the report are consistent with previous ones, with just a little modification. Relevance was replaced by materiality and balance replaced neutrality. While the meaning of the second one is almost the same, the concept of materiality is more detailed than the one of relevance. An element is defined as material if it influences the economic decision of stakeholders or if it reflects significant economic, environmental, or social impacts. The document divided the standard disclosure in 3 parts: profile, management approach and performance indicators. The most important feature that this new version added to the previous one is the division in levels of application. At the end of the preparation of the

report, the entity should indicate the Level of application of the document using the Application Level Table. That statement enable readers to know what elements they should expect to find in the report. To each level is associated a set of indicators which reflect a higher or lower level of compliance with the Guidelines. For each class, there is the possibility to upgrade the level with a plus with the use of an external verification by an assurance company.

Figure 1.4 Application Level Table



In 2011, GRI completed this version with new features related to the reporting on gender and human-rights performance indicators. Since it is an integration of the previous version, this document took the name of GRI G3.1.

Two years later, in 2013, the fourth set of guidelines was published with the name GRI G4. It was divided into 2 documents, one called “Reporting principles and standard disclosure” and the other one “Implementation manual”. The differences with the previous text are related to a higher focus on materiality and a higher emphasis on management approach. Regarding the first one, G4 guidelines provide a clearer guidance toward the determination of material aspects and their possible impact. For the second one, there is a specific section dedicated to the Disclosure on Management approach (DMA), which gives to entities how they manage material impacts. In particular, the guidelines required entities to provide DMA for every material aspect identified.

The principles that should be used writing the report are always the same: *materiality, stakeholder inclusiveness, sustainability context* and *completeness* regarding the principles for defining report content, and *balance, comparability, accuracy, timeliness, clarity* and *reliability* for defining the quality of the report.

The most evident change between GRI G3.1 and GRI G4 in the "in accordance" levels that replace the application levels. With the new guidelines, entities have 2 options that could be adopted to be defined in accordance, Core Option and Comprehensive Option. The first one indicates the fact that the report had the essential elements of the Sustainability report. So, the DMA section covers only aspects that are identified as material, and each of them should be analyzed by at least one indicator. The second option, instead, required also additional information and the application of each of the 58 General Standard Disclosure indicators that are in the Guidelines.

From the 1 July 2018, GRI G4 Guidelines are replaced by GRI Standards. They were published at the end of 2016 but became effective only from that date. One of the most important feature of the structure of the Standards, is the possibility of updating even just one of them without the necessity to publish a new version of the whole text. In fact, the GRI Standards put together the content of the two volumes of the Guidelines in a single structure which is composed by 36 standards, divided into 4 series:100,200,300,400. The 100 group is made of 3 Universal Standards, that could be applicable to every organization that want to produce a sustainability report. The first one (GRI 101 Foundation) confirmed the set of principles of the previous version of Guidelines that should be applied to define content and quality of the report. Then it describes the 2 approaches that could are valid to use the Standards. The first possibility is to use them together, with the aim of preparing a report that is defined as "in accordance". To the organizations is given the choice between the Core or the Comprehensive Option. A second possibility is to pick up Selected Standards to report on specific information. In this case it is used the term "GRI-referenced claim". If this second possibility is adopted there must be a clear and detailed reference with the part of Standard used. The second universal standard is GRI 102 General Disclosure and presents the structure of the report, divided into 6 sections. Those are: *organizational profile*, which requires a general overview of the organization, *strategy*, in which there is the strategy in regards to sustainability, *ethics and integrity*, that includes the values that the organization has, *governance*, which is made of its structure and policies, *stakeholder engagement*, in which there are the information regarding the approach used in this field, and, lastly, *reporting practice*, which means all the information used to define material topics and the content of the report. GRI 103 Management Approach defines information regarding how the organization

deals with material topics that should be present in the report. The last three series are made of Standard divided for argument: the 200 group is composed by 6 Standard related to economic issues, the 300 one by 8 environmental topics and the 400 one by 19 social patterns. The indicators adopted in the GRI Standards are the same of the G4 Guidelines, with the exception of some of them which have been modified or put together.

1.2.4 BENEFITS OF SUSTAINABILITY REPORTING

The adoption of sustainability practices and the related public disclosure could lead to a series of benefits for both companies and stakeholders. In 2013, there was the ACCA (Association of Chartered Certified Accountants) Sustainability Roundtable Dialogue, whose main theme was to discuss various aspects of that topic. During the meeting, the participants agreed on few benefits that derived from a disclosure on social and environmental issues. From the reporter side the two most important ones are a deeper knowledge of risks and externalities that the activities carried on implies and, secondly, the possibility to attract more investors. Moser et al. (2012) and Dhaliwal et al. (2012) did market-based researches based on the agency theory and confirmed that CSR disclosure is valuable for stakeholders and investors. Khaveh et al. (2012) declared that through non-financial disclosure, companies could reach a better image and gain credibility. Doing so they will be able to attract new investors. CSR reports provide important insights about the financial performance of the company or are helpful to reduce the cost of equity (Dhaliwal et al., 2012). And in this way, they give also to shareholders the information that they are looking for and they satisfy their need of monitoring. Another positive aspect emerged is the increase in discipline among managers, with a focus on the long term strategy, and the spread of sustainable practices at each level of the organization. Not less important is the benefit of cost reduction due to the increase in efficiency that the sustainability report could bring to. And associated to this, the possibility that some aspects that come out from the report lead to some innovative ideas. Gond and Herrbach (2006) confirmed that companies, in the process of improving CSR practises, can find their weaknesses and reach better financial results. Last but not least, firms could exploit the report as a communication tool and could create a stronger and more profitable relationship with stakeholders. Not only it will benefit the image of the company at the eyes of investors but could also highly involve employees and attract new talents. Hopwood (2009) stated that firms could choose to produce sustainability disclosure in order to create a new image of them or improve the existing one. Moreover, according to the author with this instrument, companies, giving spontaneously information, could avoid other questions and

keep a certain level of secrecy. With this approach, the disclosure may protect itself from external pressure. Neu et al. (1998) confirmed that sustainability disclosure could be used to improve organizational legitimacy. According to the authors, the voluntary nature of that kind of reporting is useful to preserve good relationships with the most relevant stakeholders. Lewis and Unerman (1999) stated that the non-mandatory nature of the disclosure could reflect better the ethical values of the firm and their evolution over time. Chauvey et al. (2013) indicated that comparability is a beneficial consequence of sustainability disclosure. The authors stated that over a certain report perimeter, CSR reports allow a comparison through time of data and to compare them between different companies.

From the stakeholders' point of view, sustainability reporting could increase the level of confidence toward the company, allowing them to have a better insight of the activities carried out and the impact that those have on the broader society and on the environment. In this way potential investors have the possibility to take more informed decisions. Following the substantive approach of legitimacy theory, companies improve their image adapting their actions and policies to changes in the external conditions. For external stakeholders, it is critical to understand how changes in strategies are reflected in real changes in actions. (Hopwood, 2009). Cho et al. (2013) claimed that CSR disclosure reduces the asymmetry of information between the management of the firm and the investors, leading to a reduction of the perceived risk that those have to bear.

1.3 CRITICS TO SUSTAINABILITY REPORTING PRACTISES

Together with the increase in interest for sustainability issues there has been flourishing a literature that criticize CSR reporting. The two main accusations that emerged from the critique are the lack of credibility and the incapacity to drive results toward the goal of sustainable development.

A first point regards the content: firms have space of discretion on what to report and how to report it (Milne and Gray, 2013). This characteristic has the consequence that in sustainability reports different companies could present different topics, which address the needs of few stakeholders. The critique is twofold: firstly, organizations can cherry pick the news to report despite standardization, secondly to be self-laudatory in their publications (Knebel and Seele, 2015; Milne and Gray, 2013). Milne and Gray (2013) in particular stated that "The reports often refer to 'sustainability' and 'sustainable development', but leave virtually unaddressed issues of footprints, carrying capacities, equity and social justice… And, completely unaddressed are issues of the scale of development, limits and constraints to that development and future generations, issues we identified in the previous section as core to sustainability

concerns.” . The origin of this source of criticism must be brought back to the real cause, which is the vagueness of the concept of sustainability performance (Moneva et al., 2006; Bebbington, 2001). Few institutions tried to guide organization toward the goal of reporting sustainability issue. As mentioned before in the chapter, GRI is probably the important one. However even GRI is not exempt from criticism. The first one is that its guidelines fail the attempt to increase comparability and transparency (Sethi et al. 2017). For example, Boiral (2013) conduct an empirical analysis in mining and energy sectors and found that a great majority of the companies did not present negative events that were critical for them. Another very harsh criticism regards the failure of the guidelines to create inside companies a real concern regarding sustainable development and sustainable practises (Milne and Gray, 2013; Moneva et al., 2006; Joseph, 2012; Journeault et al., 2019). Milne and Gray (2013) stated that, despite their original intent, GRI guidelines stimulate a so called “business-case” approach that could lead to a reinforcement of business as usual and so to deteriorate the level of un-sustainability of the company. Consistently with this thesis, there have been conducted empirical researches that confirmed this hypothesis. Brown et al. (2009) in their analysis found that GRI tend to suggest an approach that is narrow and instrumental and, for this reason, unfit to drive the organization toward the goal of improving its sustainability path. de Colle et al. (2014) tackled the theme from a more general perspective and stated that the standards suggested by GRI have the effect to create boundaries regarding the sustainability reporting practise: organizations focus their attention to the standards instead of concentrating primarily on the specific needs of their stakeholders. Moreover, other researchers argued that also the strict definition of sustainability performance that emerged from the standards, limited the evaluation made producing the disclosure (Laine, 2010; Gallhofer,2018). Russell and Thomson (2009) pointed out the same criticism to the indicators that the guidilines provide. Laine (2010), in line with many scholars before him, stated a more general claim, telling that the dominance of one set of standards limited other interpretations that could emerge of sustainability performance. Milne and Gray (2013) also accused the content of CSR reporting for the convergence of the concept of Triple Bottom Line as synonym of sustainability. According to the authors, the use of that concept in the production of the report, conduce to the outcome in which the document contained financial disclosure, environmental disclosure and social disclosure which respect the principles of reliability and completeness, but is not more than a 3-part account with no insights into sustainability. To have a real sustainability report the authors suggest that companies should take into account ecological literacy and the concept of social justice.

A second argument of criticism to the credibility of sustainability reporting comes from the legitimacy theory. According to that explanation of sustainability disclosure, companies decide to undertake voluntary publication because it could influence societal perception of them, increasing their legitimacy (Suchman, 1995). Bebbington et al. (2008) described CSR reporting as a publication that the management use to manage external perceptions and to defend from legitimacy threats. Cho et al. (2010), in their analysis conducted in the US, found evidence to the fact that social environmental disclosure is influenced by impression management. According to Ashforth and Gibbs (1990), there are two approaches that companies have toward legitimacy: substantive and symbolic management. While the first one support the use of sustainability reporting as a way to communicate real commitment, actions and policies adopted to conform their behaviour with social norms, the second one explains it as an instrument of manipulation. As reported by the author, symbolic management has the goal to influence positively the impression that external stakeholders have of the company through the use of apparent activities that would be perceived as a sign of commitment toward sustainability. The goal is to create the appearance, independently of the realness of those actions. Rodrigue et al. (2013) conduct an analysis whose element of study was the relationship between environmental governance and sustainability performance. The result that they found was that there is no association between the two and they use that result to confirm that the use of environmental governance is used with a symbolic approach, with no or low influence on the company. Literature is still working to understand if CSR disclosure is used under substantive or symbolic approach, but the evidences found does not improve the credibility of voluntary disclosure among sustainability issues. Michelon et al. (2015) stated that "in a symbolic use of CSR-reporting practices, disclosure would translate in the diffusion of a great volume of ''empty'' sentences or replicate boiler-plate information, in a way that offers little to enhance stakeholders' knowledge about corporate activities and their impact". Joseph (2012), regarding opportunistic behaviour of the management declared that it could be manifested through the absence or the manipulation of the vague concept of sustainability in a way in which the disclosure reflect the control of resources and outcomes more than a true understanding of what sustainability implies. To fully embrace the concept of sustainability the author suggests that a shift toward normative stakeholder view is needed. According that theory the aims of stakeholders end in themselves instead of being means to the objective of the profits of shareholders. Reed (1999) identified 3 normative principles that should be used to deal with the evaluation of the stakes in the presence of the conflicts that arise when social/environmental and organizational fields intersect themselves. Those three principles are moral, ethics and legitimacy. Joseph (2012) in its paper wrote: "the multiplicity

of perspectives may require that decision-makers recognize the issues and conflicts in evaluating costs and benefits and deciding on a course of action. Without principles that can highlight the ambiguities and develop means to resolve them, corporations will circumvent and seek loopholes to continue the status quo while managing perceptions of sustainability".

CHAPTER 2

WATER DISCLOSURE

2.1 AN ANALYSIS OF WATER SCARCITY AT A GLOBAL LEVEL

2.1.1 RIGHT TO WATER

In 2002 the UN Committee on Economic, Social and Cultural Rights agreed on a document regarding the right to water, the General Comment No. 15. The first article declared that "Water is a limited natural resource and a public good fundamental for life and health. The human right to water is indispensable for leading a life in human dignity. It is a prerequisite for the realization of other human rights.". It is detailed in the second article that this human right must ensure sufficient, safe, acceptable, physically accessible, and affordable level of water in order to satisfy personal and domestic needs. These attributes are the basic requirements for water security. But, beyond these characteristics, what primarily emerged is the importance of water in the definition of human dignity. In particular articles 11 and 12 described the condition of adequateness for water: maintaining discretion based on the heterogeneity of the conditions of different countries, a few factors are identified as fundamental. First of all, there is *availability*, which implies that water supply should be not only sufficient for personal and domestic uses, but also be continuous. Personal and domestic uses included are drinking, cooking, personal hygiene and sanitation and clothes' washing. Secondly, the *quality* is another important feature of the human right. Water must not only be available in quantity but bust be safe from "micro-organisms, chemical substances and radiological hazards that constitute a threat to a person's health.". Third characteristic that defines the right is *accessibility*, declined in *physical accessibility, economic accessibility, non-discrimination*, and *information accessibility.* Physical accessibility means that water and water facilities must be easily accessible by the entire population. They must be close to households, workplaces and educational facilities. The World Health Organization (2002) highlighted that the proximity to the source directly influences the consumption. The more the source is distant, the less water is collected and the less is available for domestic uses. Table 2.1 present the situation classifying the water service level into 4 categories, with related levels of distance and collection time, quantities collected, and the level of risk associated to that situation. These 4 classes of access reflect different levels of water security. The first group have no water security, because the high distance from the source does not allow people to collect a quantity that is sufficient for even only the basic needs, and also the quality

cannot be certified. In this case, consumption needs are not assured, and hygiene needs are possible only at the source. The second group have the source of water outside their property but is no more distant than 1000m and so the quantity that could be collected is significantly higher and is, more or less, continuous. Despite this, the quantity of water is not sufficient to satisfy all people's needs. Consumption needs are assured, hygiene ones are not. Basic personal and food hygiene are possible, while bathing and laundry are difficult. The intermediate access class could be defined to have an effective level of water security since both the quality and the quantity are sufficient to satisfy all basic hygiene and consumption needs. The fourth class have the optimal level of water security since both quantity and quality are adequate for all domestic water uses.

Table 2.1 Classification of water service levels

Service level description	Distance/time measure	Likely quantities collected	Level of health concern
No access	More than 1000m or 30 minutes total collection time.	Very low (often less than 5 l/c/d).	Very high as hygiene not assured and consumption needs may be at risk. Quality difficult to assure; emphasis on effective use and water handling hygiene.
Basic access	Between 100 and 1000m (5 to 30 minutes total collection time).	Low. Average is unlikely to exceed 20 l/c/d; laundry and/or bathing may occur at water source with additional volumes of water.	Medium. Not all requirements may be met. Quality difficult to assure.
Intermediate access	On-plot, (e.g. single tap in house or yard).	Medium, likely to be around 50 l/c/d, higher volumes unlikely as energy/time requirements still significant.	Low. Most basic hygiene and consumption needs met. Bathing and laundry possible on-site, which may increase frequency of laundering. Issues of effective use still important. Quality more readily assured.
Optimal access	Water is piped into the home through multiple taps.	Varies significantly but likely above 100 l/c/d and may be up to 300l/c/d.	Very low. All uses can be met, quality readily assured..

Source: Bartram, J. and Howard, G. (2002). Domestic water quantity, service level and health: what should be the goal for water and health sectors?. WHO.

Economic accessibility entails that water and water facilities must be affordable for everyone. Literature extensively recognised that the affordable expenditure for water should be between 3 and 5 per cent of household income. Non-discrimination calls for an equal access to water and water facilities to all, from the richest countries to the poorest ones, from the high-income part of the population to the most vulnerable one. Information accessibility consists of the capacity to both receive and communicate information regarding water issues.

2.1.2 SCARCITY OF WATER

Mehta (2014) stated that due to the multifaceted nature of water, people value it for its economic and non-economic usefulness. According to the author, taking into account only the economic aspects of water lead to an underestimation of its symbolic and spiritual meaning that it has among certain cultures. Mehta (2005) highlighted the importance that water plays in everyday life within symbolic, cultural, and social backgrounds. Moreover, Mehta (2014) recalled the heterogeneous nature of water: it is a resource that presents very different features and issues between different countries and different periods of time. The availability of water depends on *climatic characteristics*, such as temperature, rainfalls, and irrigation rivers, and on the *presence of technologies of acquisition and storage* and on *allocation regime*. In particular the author stressed the importance of the last element: "Water allocation regimes are also shaped by a mix of politics, power, and discourses and access to water in everyday contexts is usually mediated through institutions, gender, social and power relations, property rights, identity, and culture.". From the end of the 20th century, the problem of water scarcity took the attention of scholars. Bond et al. (2019) define water scarcity as the situation in which the is not a sufficient level of water in order to satisfy simultaneously the water needs of both human and ecosystem. The authors stated that this condition could arise due to a physical lack of water or could be the result of a lack of infrastructure that give access to water resources.

In 1989, Falkenmark introduce an index that promote the classification of countries according to their water stress condition. That situation is evaluated by means of water resources that are available for each person in a year time. He identified 3 levels of water scarcity: if the level is below the threshold of 1700 m^3 for each person per year, the country is defined in a situation of *water stress;* if it is below 1000 m^3 the situation is called *water scarcity;* below 500 m^3 it is the case of *absolute water scarcity*. This classification was widely adopted for the vast majority of water-related policies for a long while. Wolfe and Brooks (2003) declared that for years water scarcity was evaluated only in terms of physical presence also for the fact that it is undeniable that some countries, and in particular some regions inside countries, have a very limited supply. However, researchers also found exceptions to that bilateral connection between physical scarcity and water scarcity. There are examples for which a water shortage situation is managed efficiently, and the country did not appear in a critical situation. For example, Burke and Moench (2000) took Barbados as object of their analysis and got that result. On the other side, there could be the case of countries with an appropriate level of availability of water that are experiencing struggles to fully satisfy its water uses. Dolan et al.

(2000) took the case of Canada and found that the population of the province of Ontario experienced shortages of water even if it is near the Great Lakes.

Ohlsson and Turton (1999) exhibited a first change in the perspective of water emphasising a new focus also on cultural factors and institutions that occurred in the mid-1990s. The first one that theorized the importance of that those elements was Homer-Dixon in 1995. He defined what he called "ingenuity gaps". The term ingenuity in this analysis was used with the meaning of ideas that are used to solve issues of practical, social, and technical nature. While the vast majority of scholars that time pinpoint technology as major determinant for development, Homer-Dixon proposed alternative drivers that have a social adaptation nature. Its idea was that the way in which people are organized and in which manage their relationships is even more important than technology and natural resources themselves. According to the author, a malfunction in market institutions, that compromise its efficient use, will necessarily lead to an inadequate progress in technologies. Ohlsson and Turton identified a wider index that take into account also measures of socio-economic conditions to assess water scarcity. This model classified water scarcity condition in two categories: a shortage that is caused by a lack of natural resources is defined as first order water scarcity; if it is due to the so called "social adaptive capacity" it is second order scarcity.

Wolfe and Brooks (2003) building on these basics expand further the model. They divide the second order scarcity of Ohlsson and Turton into two categories called second and third order scarcities. The new second order scarcity resources includes adaptations that conduct to an improvement in the efficiency of the management of natural resources. This category does not make difference whether the progress derived from technological or institutional changes. Instead, the focus of third order scarcity is on the social dimension. In this case the enhancement in efficiency is due to political or cultural changes. Authors stated that "second order scarcity involves anything that moves society onto the production possibilities curve, whereas third order scarcity changes the position of the curve (i.e., uses alternative criteria and 'success' objectives).". While the first of them implies the satisfaction of the demand in a more efficient way in order to use fewer natural resources, the second one could be reached only through changes in education and lifestyle of people. In particular the importance of the latter is remarked. The three types of scarcity could occur simultaneously within a country or a specific reason but is not a common case of all situations. Each specific case have its specific implications and causes. For the same reason also the opportunities that each government have to improve its situation could be identified in a common path. The case of Israel is used as example: while the country suffer from first order scarcity, the government adopted a set of second order measures to effectively manage the problem. Different kind of

scarcity implies different option for the government water agencies: first order scarcity problems gives the most limited set of solutions for them, for second order one the set is wider, and lastly third order one has the vastest spectrum of responses. As the range of possibilities increases the level of complexity for its management became higher. The policies for a first order problem lies only on the supply side, leaving ignored the demand one. It involves improvement on an engineeristical point of view that would be aimed on expanding supply infrastructure. One of the most diffused solution on which governments are focusing their attention is desalination. Moving on with second order scarcity the approach is shifted on the demand side. With this attitude water is seen on a pure economic aspect of evaluation and though the demand is no more a fixed quantity but became influenceable by incentives and policies. The aim of these solution is to narrow the difference between the quantity supplied and the one demanded. These two approaches could limit the problem but what could give the biggest benefit is a third order scarcity approach. It involves the use of all the social sciences with the goal not to increase the efficiency of the use of water but to promote the importance of the water scarcity issues in order to create a diffused efficient use. Table 2.2 summarizes these concepts.

Table 2.2 Different types of scarcity of water

Order of scarcity	Objectives	Responses/activities	Key challenges
First	Training hydrologic engineers, geologists, irrigation and water treatment technicians.	Locate and develop water supplies, large-scale construction of dams and irrigation schemes, urban and rural water and sewerage infrastructure.	Technical issues; supplying sufficient water for all demands. Financing supply infrastructure and services.
Second	Generate and implement (training) based on neoclassical efficiency; institutional reform in line with economic priorities.	Establish economic values of water. Utility-based conservation programmes. Rationing during droughts. Reform water institutions based on economic principles. Allocative decisions based on water-use efficiency.	Financial, administrative, technical limitations. Social resistance to water as an economic good. Inadequate attention to equity.
Third	Implementing 'water-soft' paths.	Change incentives and conditions at the individual, institutional, societal levels. Responsive to individual constraints on learning with pre- and post-training activities and targeted participation. Evaluation of capacity building operational effectiveness for the institution and individual.	Increased systemic complexity — water institutions are embedded in social and physical context. Need for societal education.

Source: Wolfe, S., & Brooks, D. B. (2003). Water scarcity: An alternative view and its implications for policy and for capacity building. Natural Resources Forum, Vol. 27, No. 2, pp. 99–107.

Mehta (2014) elaborated further this model dividing the third order scarcity into two classes: a third-order scarcity which is based on a lack of adaptive capacity and a scarcity which is caused by socio-political processes. This last category of the problem arises mainly due to failures in the entitlement process. Table 2.3 presents the characteristics and the solution approach that every class presented.

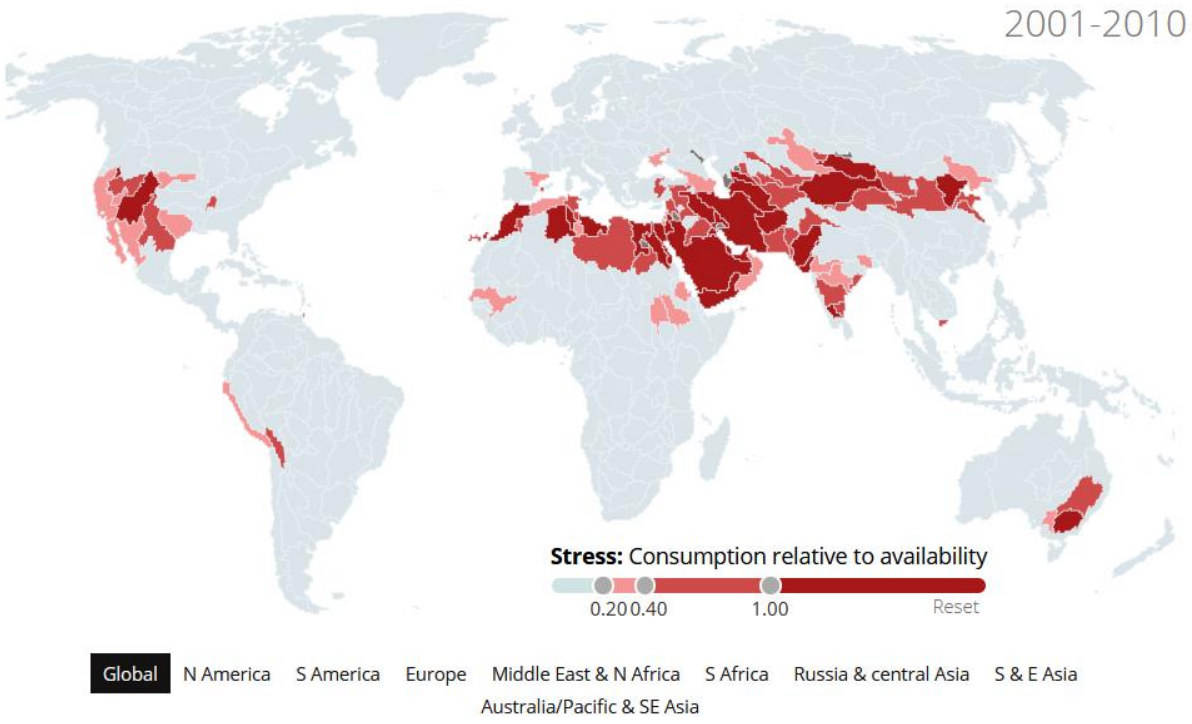
Table 2.3 4 kinds of orders for water scarcity

	(1) Physical/first-order scarcity	(2) Economic/second-order scarcity	(3) Third-order scarcity/ adaptive capacity	(4) Scarcity arising through socio-political processes
Characteristics	Volumetric quantities; Population growth; Projection of future demand; industrial growth	Inadequate development of water infrastructure; Poor management and institutional arrangements	Social, political and economic context of water management	Scarcity as a product of discursive and socio-political processes; Entitlements failures
Water management solution	Enhancing supply through storage (for example small *vs.* large dams debate); Desalination; Extra basin transfer of water	Water reallocation through water markets; water reform; Technological fixes; Pricing; Increasing efficiency	Social adaptive capacity through education, cultural change and lifestyle change	Deliberation; Decision making processes; Equity and reallocation
Access solution	MDGs; Lifelines	Water as an economic good; Pricing; Privatization; Community management/ PPPs	Social adaptive capacity through education, cultural change and lifestyle change; Decision making	Redistribution/enhancing equity; Instituting entitlements to water (for example human right to water)

Source: Mehta L. (2014). Water and Human Development. World Development, Vol. 59, pp. 59-69.

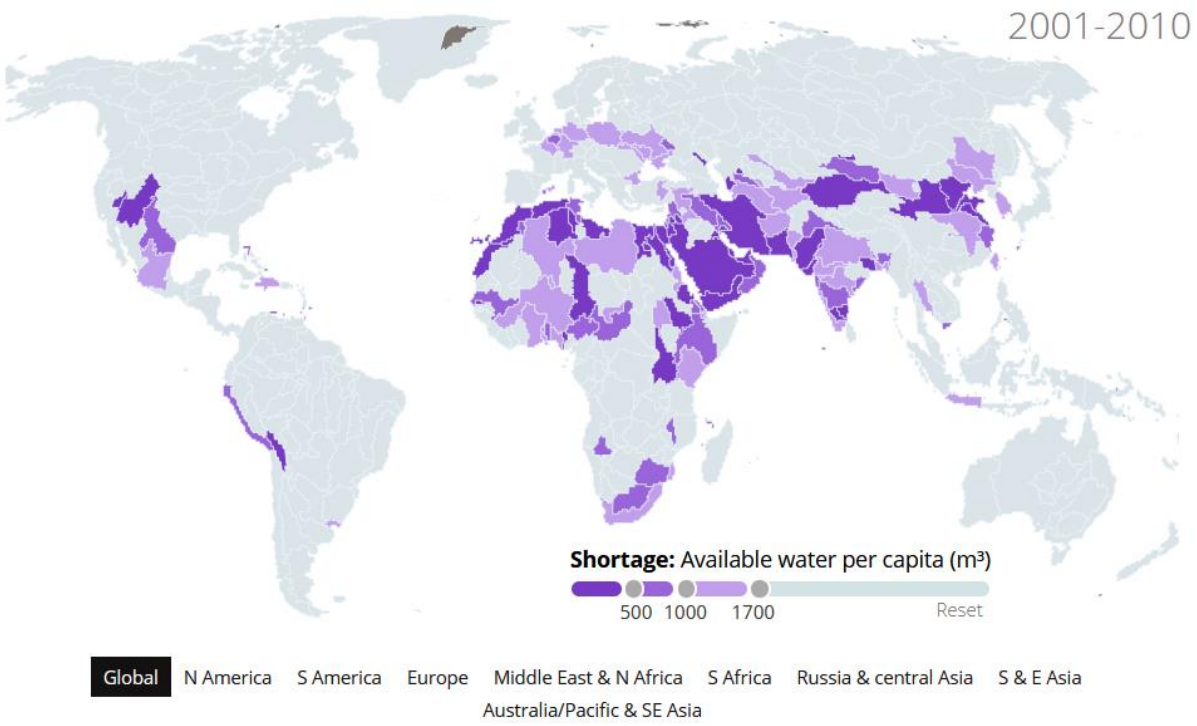
Water & Development Research Group collect data and keep updated a geographical map that allow to understand the water situation in which people leave around the world. Figure 2.1 showed the situation of water taking into account the ratio of water consumption in relation to availability at a country level. Figure 2.2 uses the definition of the three levels of Falkenmark, so looks at the availability per capita. Figure 2.3 combine the two in order to give a full picture of the situation.

Figure 2.1 Water stress situation at a global level



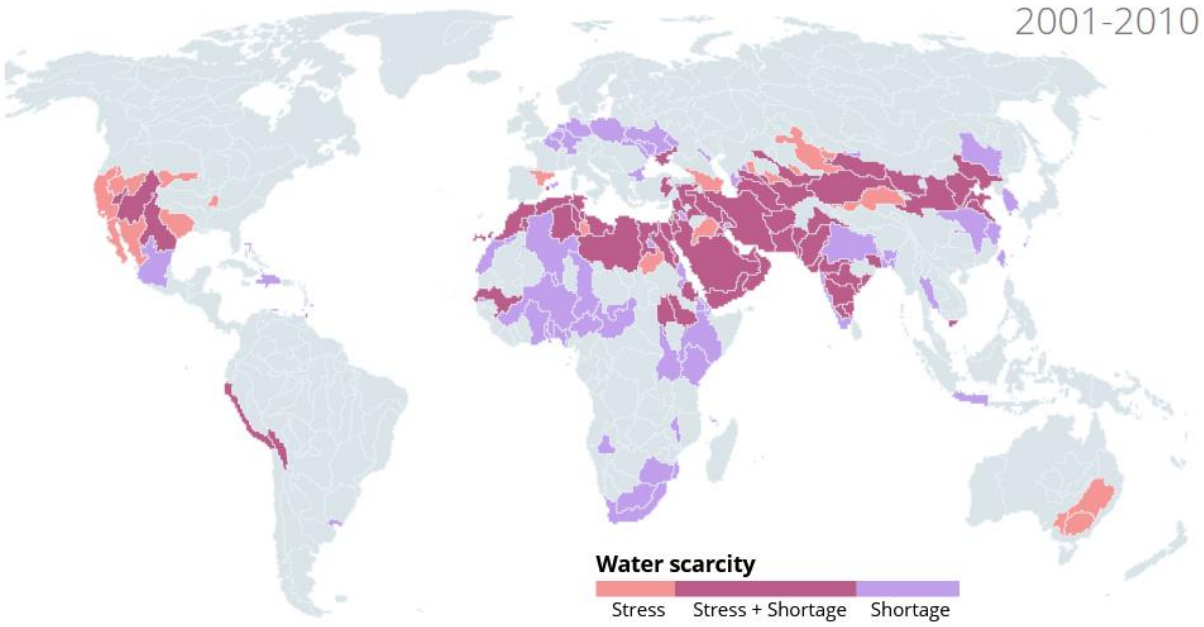
Source:
https://explore.waterscarcityatlas.org/stress#cm=watch&gv=pop&im=watergapnat&shot[0]=500&shot[1]=1000&shot[2]=1700&strt[0]=0.2&strt[1]=0.4&strt[2]=1&t0=1921&t1=1930&ts=decadal&wr=0&z=false

Figure 2.2 Water shortage situation at a global level



Source:
https://explore.waterscarcityatlas.org/shortage#cm=watch&gv=pop&im=watergapnat&shot[0]=500&shot[1]=1000&shot[2]=1700&strt[0]=0.2&strt[1]=0.4&strt[2]=1&t0=1921&t1=1930&ts=decadal&wr=0&z=false

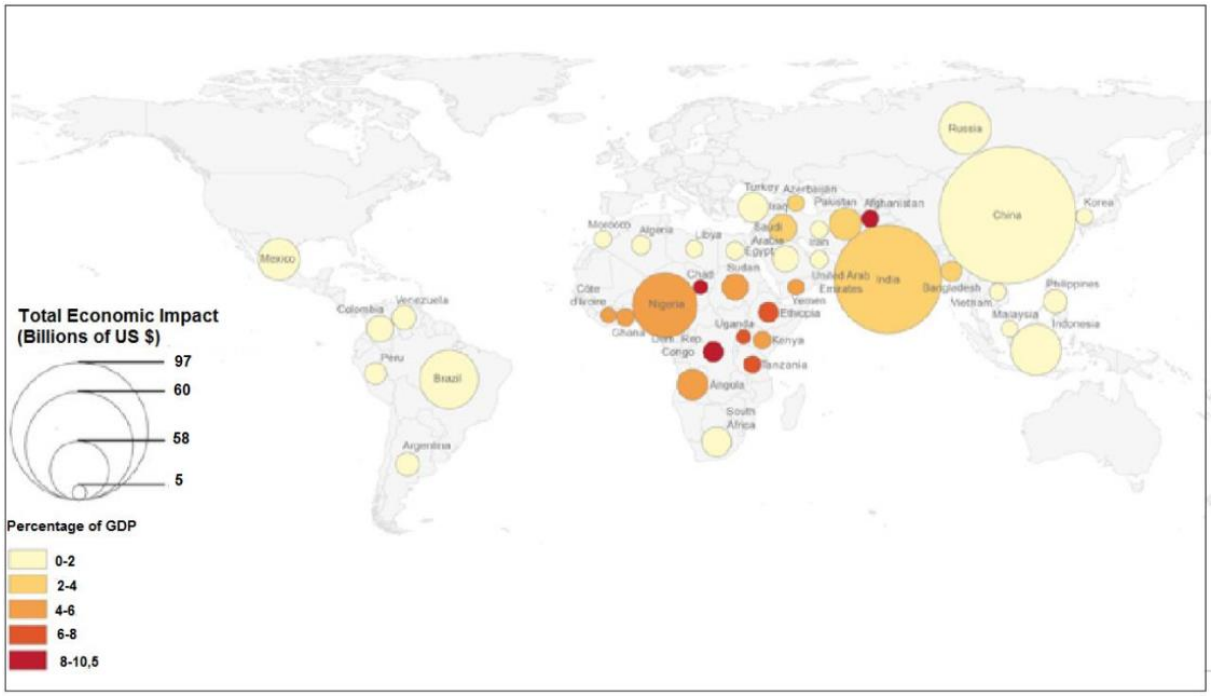
Figure 2.3 Water scarcity situation at a global level



Source:
https://explore.waterscarcityatlas.org/scarcity#cm=watch&gv=pop&im=watergapnat&shot[0]=500&shot[1]=1000&shot[2]=1700&strt[0]=0.2&strt[1]=0.4&strt[2]=1&t0=1951&t1=1960&ts=decadal&wr=0&z=false

Yıldız (2017) conduct a study on the relation between water and development. In his study he particularly analysed the relationship between the natural resource and economic growth. Water security is fundamental to enhance the conditions for development. Figure 2.4 presented the economic losses derived from a lack of access to water and sanitation.

Figure 2.4 Economic impact of water scarcity



Source: Yıldız D. (2017). The Importance Of Water in Development. World Water Diplomacy & Science News. Hydropolitics Academy, Ankara, Turkey.

However, an analysis at only a macro level would not allow to explain fully the vastity of the problem. United Nations Development Programme (UNDP) in 2006 Human Development Report analysed the links between the global water crisis and its implications for human development. One of the main results that were highlighted is that looking just at average national data hide the deep inequalities that arises within the country. Those inequalities could be caused by wealth, geographical location, and market distortions. Mehta (2014) proposed a human development approach that allowed to break down the analysis at a deeper level. Only in this way it emerges how the right to water in many parts of the world is violated. The author based its study on the entitlement approach developed by Sen (1983). According to that theory, entitlements are the full set of goods and services that a person can get within the society to which he belongs using all his/her rights and all his/her opportunities. They represent all the possibilities that could be achieved. An entitlement approach allowed the author to overcome the limit results that could be find through a per capita availability of water that does not reflect the discrimination that occur around the world. An equal access to water could be violated by political institutions or by cultural factors. There are countries in which, despite there is not a problem of water availability, a part of the population does not

have the supply of the natural resource. In this perspective, a lack of water is an entitlement failure. The ones that have the lowest entitlements are the poorest. Mehta (2014) stated that "Poor and landless rural dwellers may lack endowments such as irrigation facilities and wells that can help them have secure water supplies.". At the same time those that cannot have enough financial resources to get resources from safe sources is forced to get it through unsafe ones, with the risk of consume polluted water which leads to health diseases. International statistics identified the sources of water between 2 categories: improved and unimproved ones. The technology which provides water determine its classification: standpipes, in-house connection and protected wells belong to the first class, while vendors in water tracks or unprotected wells are examples of the second group. While the classification is clear in theory its practical use is less easy to manage. People belonging to poor social classes usually have to live with the use of both kind of sources to satisfy daily needs. While in developed countries people use a single provider, in developing societies they cannot rely everywhere on the primary network. It usually serves only citywide locations, while who lives in rural areas have to get it from intermediaries. Utilities provided by governments use pumps and pipes that arrive directly in houses and business facilities. The poorest household that live across cities instead have to depend on public standpipes. Those structures are usually managed by local organizations that operate in accordance with the municipal provider. Even this kind of resources are not useful to reach all the people with especially those living in slums and remote locations that remain too many times unsatisfied. For those the most important resource of water are water vendors that, through tracks, collect water in public standpipes and then sell it in the places that have not connection with other networks, through kiosks. Those who bear the heavies burden of water scarcity are poor people living in rural areas. They are the ones with the lowest coverage rates of water supply. UNDP (2006) identified three main reasons behind this fact. First of all, within a country they are one who lives in the driest areas, suffering more seasonal shortages. Secondly, in these places not only the connection with the main network has to be organized from the community, but also the maintenance and the expansion of it must be managed by local committees. Third explanation is related to the little influence that these communities have on politics and infrastructure decisions regarding the theme. For these reasons, poor people living in rural areas usually recurs to unimproved sourced of water, like rivers or stream, with the related exposition to possible diseases that could unsafe water bring.

Prüss-Ustün et al. (2019) analysed the level of access to water sources in low and middle income countries for 2016 and reported the results of table 2.4.

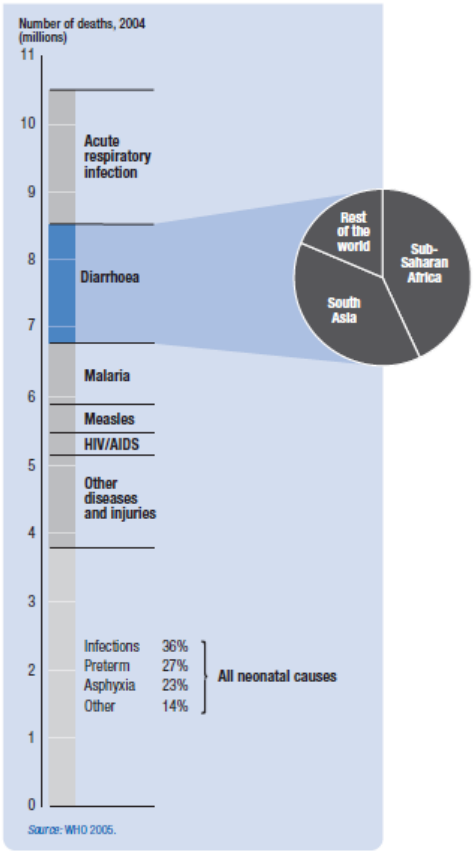
Table 2.4 Access to water by source in LMICs

Region	Percentage of population using						Total
	piped water on premises		basic drinking water, not piped on premises		surface, unimproved or limited water		
	not filtered or boiled[a]	filtered or boiled	not filtered or boiled	filtered or boiled	not filtered or boiled	filtered or boiled	
Sub-Saharan Africa, LMICs	25.5	3.1	29.6	2.0	35.8	4.0	100
America, LMICs	58.3	32.3	4.6	1.1	2.9	0.8	100
Eastern Mediterranean, LMICs	53.8	4.8	26.0	0.7	13.7	0.9	100
Europe, LMICs	55.6	29.3	6.9	4.1	2.5	1.7	100
South-East Asia, LMICs	24.9	12.7	38.6	13.0	7.2	3.5	100
Western Pacific, LMICs	28.5	50.7	8.8	8.3	1.6	2.1	100
Total LMICs	34.1	23.5	22.6	7.0	10.2	2.6	100

Source: Prüss-Ustün A. et al. (2019). Burden of disease from inadequate water, sanitation and hygiene for selected adverse health outcomes: An updated analysis with a focus on low- and middle-income countries". International Journal of Hygiene and Environmental Health, Vol. 222, pp. 765-777.

Clean water is beneficial as a preventive medicine in order to cut the number of child mortality (UNDP, 2006). This in particular is true for diarrhoea, which is the second biggest cause of it. From figure 2.5 shows the cases of children deaths during 2004. What is evident is that the majority of cases of diarrhoea happened in the places that most experienced the problem of water scarcity.

Figure 2.5 Child deaths causes



Source: United Nations Development Programme (UNDP). (2006). Beyond scarcity: Power, poverty and the global water crisis. Basingstoke: Palgrave.

Moreover, poor water and sanitation could lead to chronic diseases which have effects for the entire life of a person. These conditions have economic implications that can further worsen

the living conditions of these people: in particular, expenditures for those issues will cause less income and losses of future income. When they got ill, their capacity to be productive decline, leading to lost earning and a declining ability to face future expenditures with their own economic resources.

UNDP (2006) found that one third of those who does not have the access to an improve source of water have to live with less than $1 a day, two third of them live with less than $2. Despite the right to water, inequality is still a phenomenon that is easy to occur in many countries, but in developing countries it is far more evident than in developing ones. For who leaves in not industrialized places, the economic situation that a parson has characterize the possibilities and the types of water sources one which he/she depends on. The role of public finance varies between countries. While in high-and medium-income states costs are divided between households and governments, in low-income ones the intervention of the government must be wider. In the first case, household support operating costs and authorities covers the capital costs that are required to create the network; in the second one the pricing structure must implies higher public investments. On this theme of water pricing, literature found opinions that support opposite thesis. On one side there are those who support the idea of cost sharing, one the other side there are those who think that market principles will lead to an exacerbation of the actual situation in which there is someone who have almost illimited access to water and someone who cannot afford neither the level that is required to satisfy basic human needs. In developed countries it is not unusual to see a situation in which the poorer people are the ones who pay the more. UNDP (2006) highlighted that there are cases in which poor people living far from cities, in slums, are the ones who pay prices that are higher of the ones of rich countries. The most factor that influences this outcome is the distance between sources and final users. As said previously in the chapter, they must rely on a number of intermediaries to have water and consequently the price of the resource increase with the number of steps that are required. The easiest way to solve this problem is through the expansion of the network, but this possibility is limited by the high cost that are needed for the infrastructures. Water tariffs are the main driver of availability of the resource. OECD (2010) declared that the only way in which tariffs for water could be considered sustainable is taking into account economic efficiency but at the same time social concerns and a sustainable level both from an environmental point of view and on the financial one. Barraqué (2020) calls for the need of fair, affordable and sustainable level of tariffs and that a certain amount of subsidies to the poorest is required in order to ensure the satisfaction of the human right. At the same time, the author highlighted the importance of economic efficiency and financial sustainability. Tariffs should be set at a level that at the same time ensure

affordability for everyone and generate a profit that covers the costs of the service. UNDP (2006) found that in some countries, such as Bangladesh, there were policies that inevitably lead to an unsustainable outcome. That country adopt a flat tariff structure according to which the volume of consume does not change the tariff paid. It is easy to say that this policy does not give any incentive for an efficient use of the resource. The most diffused types of tariff is the block one, according to which the price increases with the volume of use. With this type of pricing method, the level of efficiency of the system is aligned with the goal of sustainability with the level of revenues that is proportional with the costs of the service. The benefits are twofold: from one side it allows to charge prices lower than operative costs for those who just use water to satisfy basic needs, from the other side it create a system in which people is disincentivized to overuse. This type of pricing however is not perfect and could lead to a worst outcome if bad managed. First of all, to be sustainable it requires enough high-quantity users to compensate for the lower prices charged to low-quantity users. And prices should be set at a level that should not create the incentive for high-quantity users to shift to other sources of water. Moreover, this system damage those who does not have direct access to the network because they have to get it from intermediaries that bought it in huge quantities and so are paying the higher prices. These higher prices are than reflected also in higher charges that they will ask to final users. At the same time if habitants of rural areas outside the network group together in a common demand they will be pushed into higher prices tiers. Other problems that could face developing countries adopting this method, is the ability to enlarge the network. With the lower prices charged in order to allow the access to everybody, they could experience a shortage of financial resources that are required to build new infrastructures. Marques and Miranda (2020) remarked that increasing block tariffs could be a good solution in many countries, but the is not a one-size-fits-all solution since the best practices that could be used within a country is influenced by many factors, going from cultural to legal to technical ones. Another limit that emerged from its study is the difficulty in the identification of people who are entitled to discounted rates that have not access to the direct network.

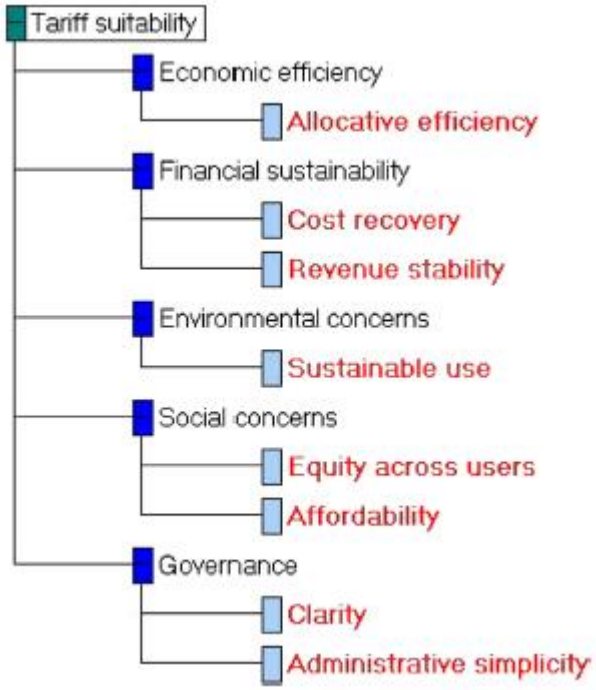
OECD in 2009 formulated that 3Ts concept which identified the three main financial resources that could be used for investments in water supply services: Tariffs, Taxes and Transfers. The goal of the government is to reach the right balance between them in order to create a system that is sustainable in the long run. Financial resources must be set at a level that should be aligned with social and environmental objectives. However, Massarutto (2020) put the attention on the fact that some objectives behind the decision upon the appropriate tariff strategy could be in conflict between themselves and that it is impossible to provide a

solution that fits for each of them. The author declared that it is important that government have in mind that social value of water have the priority oner the economic one. So before deciding water pricing, authorities must understand if the chosen system is a redistributed instrument useful to reach the goal of ensuring availability to everyone or if it could be a barrier to it. Neto and Camkin (2020) focused their attention on the social dimension of water services and stated that it is a right, not a privilege, and for this reason tariffs should be set with the goal of the promotion of the human right. The authors stated that "Any tariff system needs to be discussed in this context to avoid perversity and deviation from the core objectives and principles of society, such as inclusiveness and equity.". Increasing block tariffs characterized by very low price for the minimum quantity necessary for the most basic needs is indicated as the best solution to reach the goal. But, according to them, the prices set must not only aim the recovering of costs of the delivery of the service but should firstly reflect the social importance of the water supply in satisfying a human right. Neto and Camkin call for the need of a better governance, for an increase in the strength of institutions and for the switch to inclusive approaches that aim a socially sustainable system of tariffs regarding water.

Boelens et al. (2018) asserted that the only way in which social injustice could be challenged is through the recognition and the modification of politics regarding the management and governance of the use of water. According to them, water crisis is in most cases the effect of wrong policies and corruption among the governments more than the reflection of water scarcity. And water scarcity is more the result of a violation of the equity principle of the human right than a physical lack in the availability of the resource. Marques (2020) stated that, nowadays, the water sector is weakened by a lack of governance more than by a scarcity of financial resources. And the bad governance of water policies is usually seen in its pricing. A poor communication channel characterised by asymmetries of information, little engagement with stakeholders and the lack of accountability, among all problems, are reflected in tariffs that are little incentivized usually in developed countries. Barraqué (2020) remarked the importance of governance toward a sustainable water sector. In particular, the author distinguished between two types of governance: an internal and an external one. The first one involves new relationships within operators and users of water sector; the second one deals with an improvement in relationships between water services and external partners such as authorities, suppliers, or external consultants. Sampaio and Sampaio (2020) analysed the case of Brazil and found that the bad governance is the cause of the financial unsustainability of water sector in the country. In particular, Brazil have a three-level authority federalism that penalizes an efficient system. Only now in the country it is going on a reform of the

regulatory framework which gives the power to set regulation to a federal institution. Pinto and Marques (2016) agreed that a more institutional approach is needed in a context in which there is too much room for arbitrariness regarding the tariff structure. They identified the main dimensions that should be taken into account and associate them to the criteria on which they must be based. Figure 2.6 presented their scheme in the hierarchical order that they suggest.

Figure 2.6 Dimensions of tariff's scheme



Source: Pinto, F.S., Marques, R., 2016. Tariff suitability framework for water supply services. Water Resour. Manag, Vol. 30, No. 6, pp. 2037–2053.

This multi-dimensional approach should influence the structure of tariffs system even before than the quantification of the prices. According to the authors in many countries, belonging to both developed or developing countries, the tariff structure does not send correct incentives to customers in economical or environmental aspects. An example of this is the result find by Mercadier and Brenner (2020) in Argentina. The tariff structure of Buenos Aires has been found to be consistently penalizing for the sustainability of the sector, giving no incentives to the provider of supply for improving the efficiency. In that particular case, it was found that the government failure resulted from the absence of indexation of prices to real inflation. On the other side, Molinos-Senante et al. (2019) conducted a study whose main aim was to identify whether companies in Chile have incentives to reduce their water leakages. They found that the shadow prices of water leakage in most of the cases are higher than the volumetric tariff set and so that most of the companies should have incentive to reduce its level of leakage. At the same time the historical analysis found that across years they have not

reduced it. This means that a governmental intervention is needed through the use of penalties to achieve better targets.

Regarding governance of water suppliers, literature has hugely investigated the role of private and public involvement in the water sector. The debate has from one side supporters of the thesis that higher private involvement in water sector lead to an increase in the levels of efficiency, accountability, and transparency. On the other side, the supporters of the public involvement argue that, since water is an essential resource for human life, it must not be treated as a pure economic good and that market principles will preclude availability for all. At the same time, private involvement not always lead to market efficiency. Regulation has a key role in shaping the outcome of private intervention. In a good institutional environment that create competitive pressure, establish appropriate targets, and set quality standards, private intervention could provide technologies and skills in order to enhance the sustainability level of water sector. But as Massarutto (2020) stated there is not a 'one size fits all' solution and it is not easy for governments to create an effective regulatory environment. UNDP (2006) reported that at the beginning of the 19th century the supply of water was in both Europe and United States in the hands of private companies. But by the end of the century they was almost everywhere replaced by public providers because it arose the idea that water was too important for public health to let it in the hands of private companies whose main aim was maximize their profits. The weaknesses of public providers were manifested through poor governance practices or through the recurrence of the decay of the infrastructure due to the lack of investments. Poor governance was reflected in lack of transparency and the incapacity to adapt to the needs of users. A vicious cycle was a path that was not unusual to see: the low prices charged in order to give access to everybody were reflected in lower revenues, that means lower investment possibilities in maintenance, with the consequent water losses that return to lower revenues. This does not mean that private providers are necessary for a good service but highlights the importance of a good governance for a good public service. On the other side the access of private companies into water supply can took several forms. UNDP (2006) identified 5 main types, that are represented in Table 2.5.

Table 2.5 Private/public provider arrangements

Option	Ownership	Management	Investment	Risk	Duration (years)	Examples
Service contract	Public	Shared	Public	Public	1–2	Finland, Maharashtra (India)
Management contract	Public	Private	Public	Public	3–5	Johannesburg (South Africa), Monagas (Venezuela), Atlanta (United States)
Lease (affermage)	Public	Private	Public	Shared	8–15	Abidjan (Côte d'Ivoire), Dakar (Senegal)
Concession	Public	Private	Private	Private	20–30	Manila (Philippines), Buenos Aires (Argentina), Durban (South Africa), La Paz-El Alto (Bolivia), Jakarta (Indonesia)
Privatization (state divestiture)	Private	Private	Private	Private	Unlimited	Chile, United Kingdom

Source: Jaglin 2005.

Source: United Nations Development Programme (UNDP). (2006). Beyond scarcity: Power, poverty and the global water crisis. Basingstoke: Palgrave.

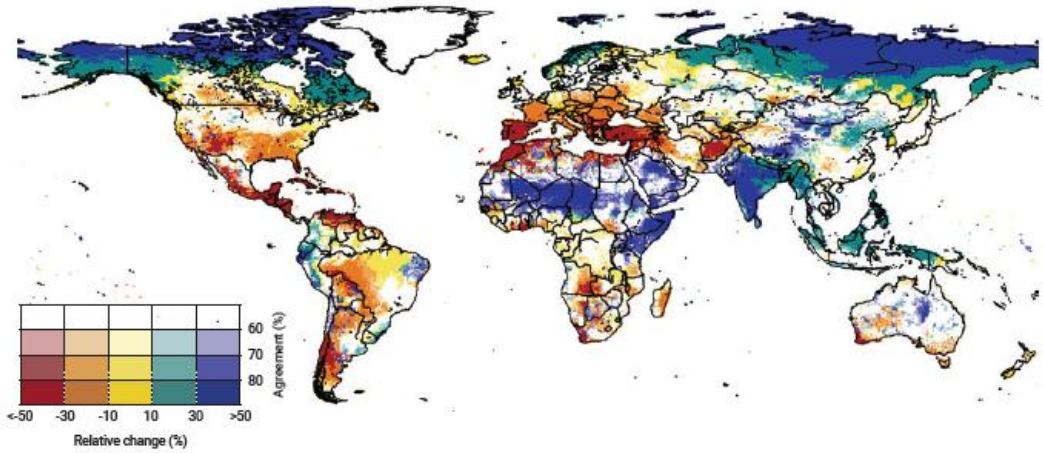
Bel (2020) conduct a deeper analysis on the drivers and effects of both remunicipalization and privatization. He found that, due to the increasing criticism around the public interest theory explanation of public providers that happened during 1990s, a new trend toward the consensus of privatization took place. The main drivers of this solution were fiscal restrictions and the need for increasing efficiency. The author reported that it is usual to see a positive influence that financial constraints have on privatization in Europe. To interpret the increase is efficiency there are reported two main explanations. First of all, there is the scale of operations. With the aim of exploiting economies of scale, small municipalities gained from privatization and a negative correlation between the level of population and privatization. More recent studies instead found the opposite result, probably due to the fact that changing costs are too heavy for small municipalities, while larger one can easily manage them (Bel, 2020). The second reason reported by the author is the fact that market competition is more likely to improve efficiency and lead to cost savings. Instead, Bel and Fageda (2007) does not find evidence in the support of the thesis that the ideology of who's in charge for the government influence the decision upon privatization. As regards drivers of remunicipalization, the author found that are based on specific factors inside the country. In Bolivia and Argentina they were triggered by increases in prices, in France by evidences of corruption and overpricing. The common factor found was that the decision of municipalization is more a practical than an ideological one. Studies on effects of both kind of policies present contrasting results. In many cases it was true that a switch from private to public provider lead to a decrease in prices, but at the same time there are cases that provide evidences that following that switch the investment after remunicipalization significantly

decrease. This suggest that lower prices are not sustainable in the long run. The author reported that is true that public providers could lead to lower fear of corruption. As regards efficiency, literature is quite in accordance to the outcome that there are no significant differences between private and public management.

2.1.3 CLIMATE CHANGE IMPACT ON WATER SCARCITY

Wu et al. (2019) identified in increasing population and industrialization the two main causes of the greenhouse gas emissions increase. These emissions consequently heavily impact the environment and the climate changes that since the end of the 20th century affected our planet. Water is one of the most resources impacted by this issue. The increase in temperature inevitably changes the hydrologic cycle and strengthen the global water crisis influencing both demand and supply. The Water Development Report of 2020 is fully dedicated to the relationship between water and climate change. The most relevant issues raised by climate changes affected the supply of water. First of all, as highlighted by Schewe et al. (2014) the increasing temperature together with the changes in the flow of precipitations have a direct impact on the quantity of water available. Higher temperatures reflected in higher evaporation which put even more emphasis on the situation of shortage of driest part of the world. Moreover, literature found that during last years a decrease in the level of rivers have happened. This fact impact not only domestic needs of household but have a huge impact also on sectors like agriculture and other water intensive industries. The increase in temperatures also lead to an acceleration of the melting process of glaciers which impacted especially the level of available water of mountains regions. While this could cause in the short term to an increase in the streamflow of rivers, this is not sustainable for the long-run. Figure 2.7 present the effect of a change of 2°C in the annual availability to water compared to the actual level.

Figure 2.7 Effect of temperature's increase on the availability of water



Note: This figure depicts the relative change in annual discharge at 2°C temperature increase compared with present day, under RCP8.5.

Source: Schewe et al. (2014, fig. 1, p. 3246). The Attribution Share-Alike 3.0 IGO (CC BY-SA 3.0 IGO) licence does not apply to this figure.

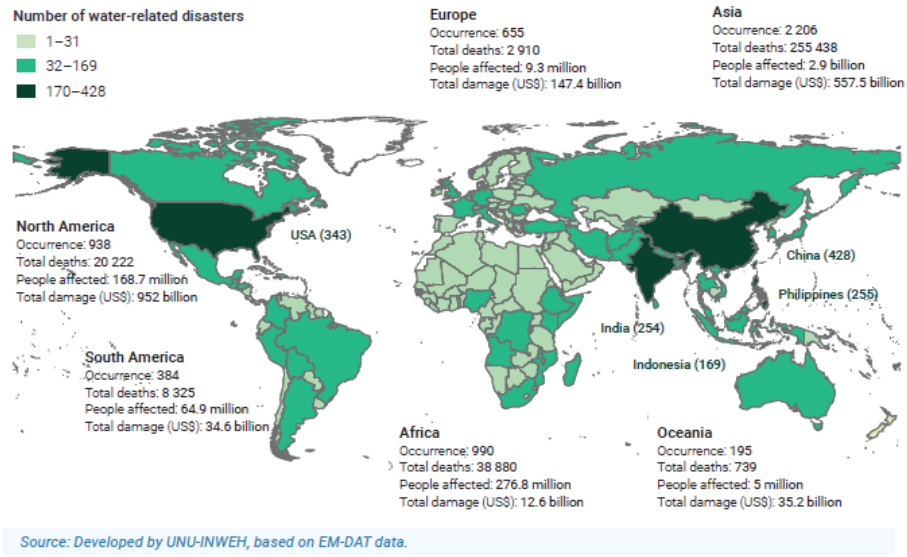
Source: UNESCO, UN-Water, 2020: United Nations World Water Development Report 2020:Water and Climate Change, Paris, UNESCO

Olabanji et al. (2020) conducted a study on the impact of climate changes in the Olifants region of South Africa and found that precipitations are expected to have a decline between 5 and 30% under both a moderate and a high level of concentration of greenhouse gases cases.

On the other side, OECD in 2012 projected that water demand will see an increase of more than 50% between 2000 and 2050 due to the shift in consumption that is brought by economic industrialization and development and a parallel increase in population. Gato et al. (2007) remarked that also global warming will create an increase in the consumption of water since they found a positive relationship between increasing temperatures and water use.

Moreover, the change in the flow of precipitation will lead also to an increase in the frequency of extreme events such as floods and droughts (UNESCO,2020). Figure 2.8 presented the cases of water related disasters divided for geographical regions and the consequent economic negative impact. As could be seen the most damaged country is North America, which is too much often hit by hurricanes and other extreme events.

Figure 2.8 Water-related disasters



Source: : UNESCO, UN-Water, 2020: United Nations World Water Development Report 2020:Water and Climate Change, Paris, UNESCO

Water infrastructure is also impacted by floods and huge rainfalls. Floods in particular are frequently cause of damage the service operations. As Octavianti (2020) reported, the supply of water could be interrupted if the capacity of the water mains is not able to resist to inundations. So it might happen that during flooding events people will experience water scarcity. DeNicola et al. (2015) stated that not only climate change will influence the quantity of water but also the quality: extreme precipitations lead to the degradation of resources through the pathogens and contaminants that are contained inside their water. They found evidence that an environment with higher temperatures promote the conditions for the diffusion of water-borne pathogens. In this case, the quality of water became a matter for public health. According to Octavianti (2020), this problem of quality could be affected floods water for example.

Lastly, climate change could also compromise the effectiveness of the infrastructure of storage of water. Rocha et al. (2020) indagate the impact on 2 reservoirs in the Mediterranean region: Monte Novo and Vigia. They found that in the case of moderate concentration of greenhouse gases the main problem is related to the increase of phosphorus which will cause a problem of water quality. In the case of high concentration the most important issues are raised from the scarce inflows. In particular the Vigia reservoir raises a bigger problem because of the increase of irrigation water needs.

The problems highlighted for both the demand and the supply side evidenced the need for the use of alternative water resources, but the use of this unconventional sources require the use of particular processes or technologies. UNESCO (2020) identified safe water reuse,

desalination of seawater, atmospheric moisture harvesting as effective alternative sources. Regarding the first one, the main issue regards the process of transformation from wastewater to a safe one. DeNicola et al. (2015) supported the thesis that water recycling is an efficient way to satisfy the demand on water resources, and that is could be useful to both water and food security. The problem is that wastewater contains high level of microbial contaminants which require a demanding process prior to reuse. Their analysis in Saudi Arabia found that in the country people is not confident on the fact that the process of elimination of those contaminants is safe. So in the Saudi Arabia people was still reluctant to use that type of resource. Olabanji et al. (2020) also highlighted the benefits of water reuse toward the reduction of overexploitation of the freshwater of the system. Desalination regards the transformation of salt seawater into freshwater removing salt. This type of resource is said to have a huge potential for the future due to the unlimited nature of seawater. The main limit to this process is the fact that it requires high levels of energy. The analysis of DeNicola (2015) reported that Saudi Arabia is the largest producer of desalinization process. The reason behind this fact is the availability of oil of the country. The authors remarked the drawback of the process: “increasing energy-intensive desalination infrastructure will continue to negatively affect surrounding water ecosystems and contribute to greenhouse gas emissions, aggravating climate change and exacerbating the global effects that they are combating in the first place.”. Moreover, Saudi Arabia could afford to exploit heavily this source compromising a sustainable use of oil, which raises doubts on the long-term affordability of this solution as it is done nowadays. The third solution is atmospheric moisture harvesting which consists in the collection of water from the fog. Instead of desalination, this is a low cost approach but could be done only in fog-abundant areas.

DeNicola et al. (2015) remarked the importance of facing climate change and water scarcity as global public health issues and that countries have different possibilities to adapt to the effects of those problems. In this sense global cooperation is highlighted as fundamental in order to promote resilience toward climate change issues. According to the authors it is a common concern to give all countries an equal possibility to face the effects of climate change, limiting the negative drawbacks on health.

2.2 SUSTAINABLE DEVELOPMENT GOALS

2.2.1 GOAL 6: ENSURE ACCESS TO WATER AND SANITATION FOR ALL

As previously remarked in the chapter water is a human right and is fundamental in every aspect of human development. It is at the basis of the economic activities of many sectors, from agriculture to energy; it is necessary for the equilibrium of the environment and it has a strong social meaning, since the presence or the lack of water are clear representations of the equity pattern of a country. UN identified, with a resolution of the General Assembly one the 6 July 2017, 8 Targets for SDG 6, which are presented in Table 2.6.

Table 2.6 Objectives of SDG 6

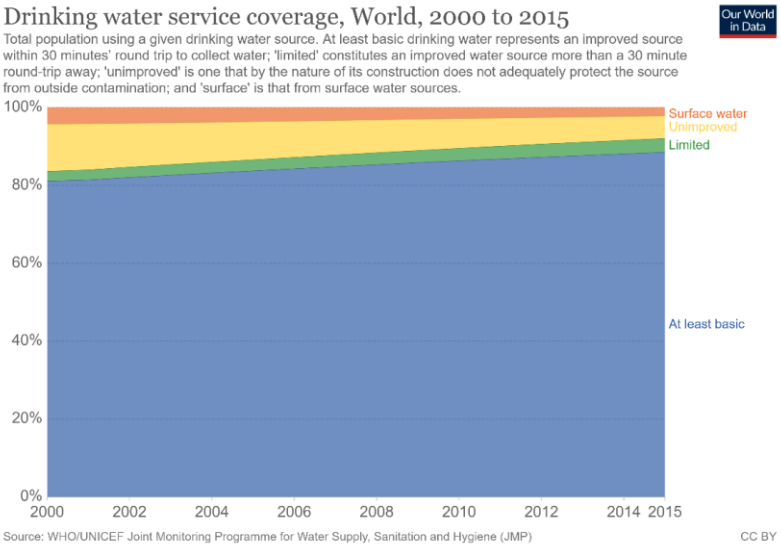
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all
6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
6.A By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies
6.B Support and strengthen the participation of local communities in improving water and sanitation management

Source: https://www.un.org/sustainabledevelopment/water-and-sanitation/

These 8 targets are measured by 11 indicators. The first two targets treat the themes of unequal access to both water and sanitation. Regarding the first one, it is calculated through the “Proportion of population using safely managed drinking water services”. A service to be considered like this must respect the conditions of location on premises, availability when needed and free of any form of contamination. Target 6.2 is indicated through the “Proportion of population using (a) safely managed sanitation services and (b) a hand-washing facility with soap and water”. The recent COVID-19 pandemic highlighted in particular the importance of the second measure stressing the role that handwashing has in the prevention of the diffusion of pathogens that lead to diseases. Figure 2.9 and 2.10 present respectively the

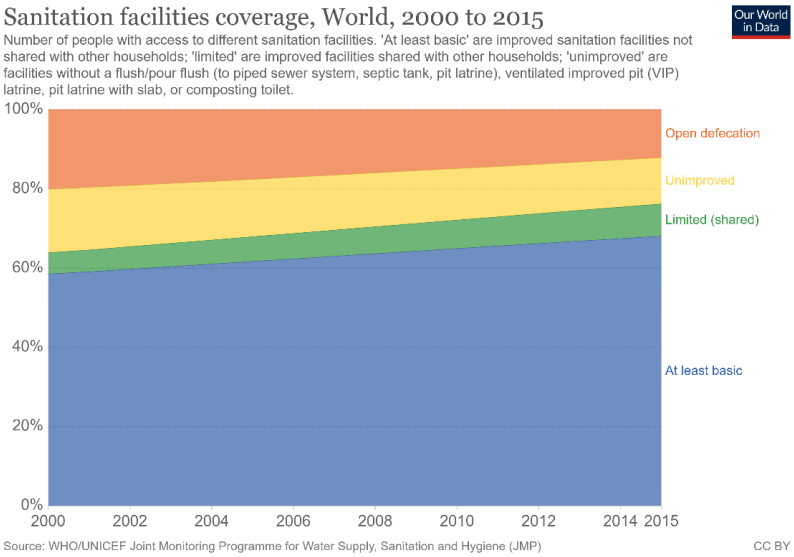
trends of coverage of drinking water services and sanitation facilities among the global population.

Figure 2.9 Drinking water coverage between 2000 and 2015



Available at: https://ourworldindata.org/grapher/drinking-water-service-coverage?stackMode=relative

Figure 2.10 Sanitation facilities coverage between 2000 and 2015



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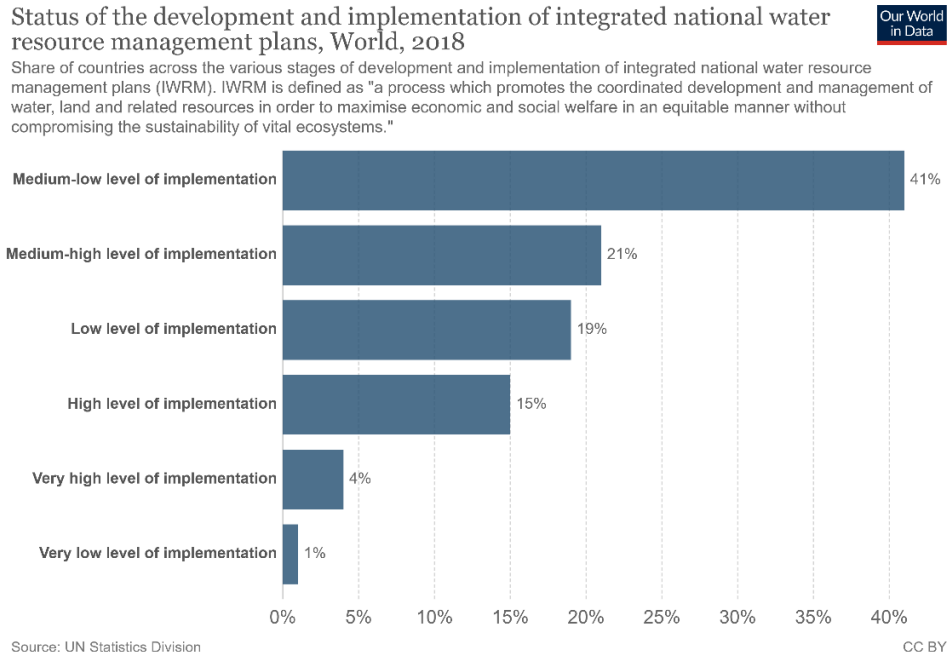
Target 6.3 regards the quality of water and is though measured by the “proportion of wastewater safely treated” (6.3.1) and the “proportion of bodies of water with good ambient water quality” (6.3.2). Target involves the efficiency in the use of water and is evaluated through 2 indicators. The first one is the “change in water-use efficiency over time” (6.4.1); the second one is the “level of water stress: freshwater withdrawal as a proportion of available freshwater resources" (6.4.2). To the management of water resources is dedicated the fifth target and is measured by the “degree of integrated water resources management

implementation (0-100)" (6.5.1) and by the "proportion of transboundary basin area with an operational arrangement for water cooperation" (6.5.2). As regards indicator 6.5.1, figure 2.11 divided global countries for their level of implementation of water management plan. What emerges is that slightly less than half of countries in 2018 are still in a medium-low level of implementation, while only 15% of them are in a high level class.

Figure 2.11 Levels of implementation of integrated national water resource management plans in 2018



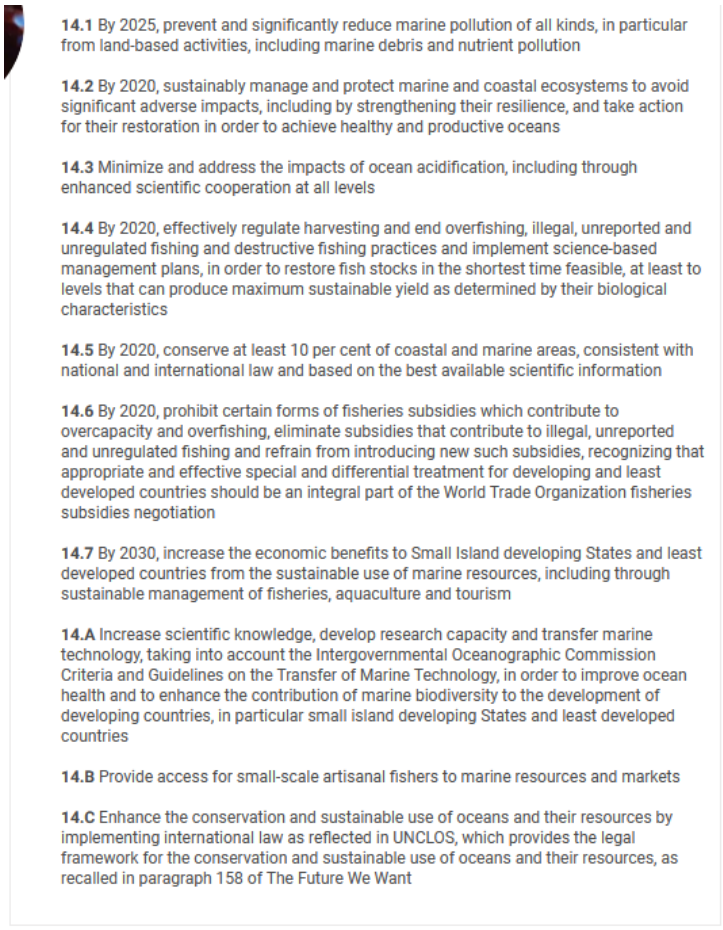
Available at: https://ourworldindata.org/grapher/status-of-the-development-and-implementation-of-integrated-national-water-resource-management-plans

Target 6.6 is dedicated to the protection of ecosystems and its indicator is "change in the extent of water-related ecosystems over time". It is curious that this is the only target that is projected toward 2020, while all other water related goals are set upon 2030. Targets 6.A and 6.B highlighted the importance of collaboration of everyone to ensure the satisfaction of the human right to water. The first one aim a global collaboration in order to ensure and promote water and sanitation programs in developing countries. This goal is measured by the amount of water- and sanitation-related official development assistance that is part of a government coordinated spending plan". The second one, instead, looks a local engagement and indicator 6.B.1 is calculated as the "proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management".

2.2.2 GOAL 14: CONSERVE AND SUSTAINABLY USE THE OCEANS, SEAS AND MARINE RESOURCES

UN in its site remarked that oceans and seas are the natural resources that effectively regulate most of the basic elements that characterize human life, going from rainwater, to weather, to food, to the oxygen. For this reason, it is important to manage them in a proper way in order to ensure a sustainable future for next generations. UN identified 10 targets for SDG 14, presented in table 2.7. Due to the importance, while most of SDG are decided upon 2030, most of these are projected toward 2020, one toward 2025.

Table 2.7 objectives of SDG 14



14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans

14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels

14.4 By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics

14.5 By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information

14.6 By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation

14.7 By 2030, increase the economic benefits to Small Island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism

14.A Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries

14.B Provide access for small-scale artisanal fishers to marine resources and markets

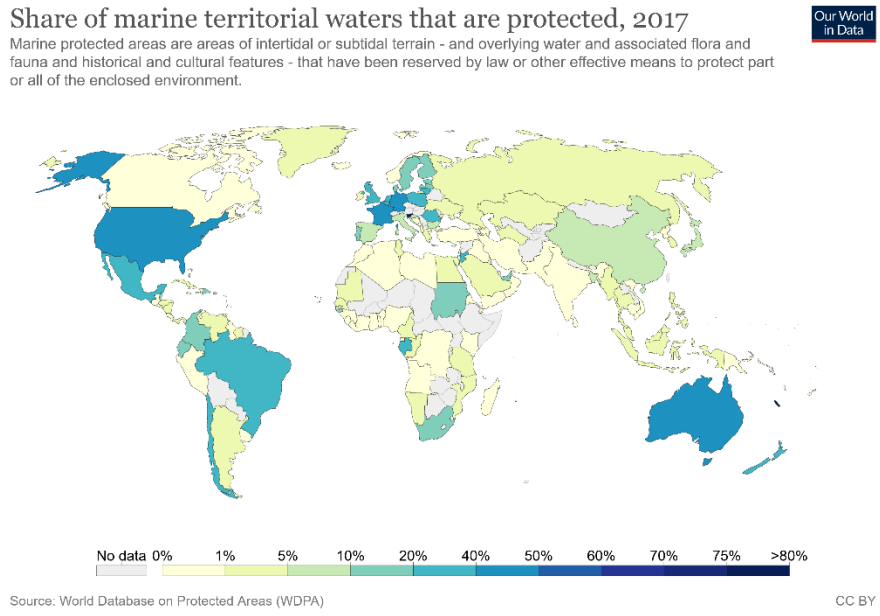
14.C Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in UNCLOS, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of The Future We Want

Source: https://www.un.org/sustainabledevelopment/oceans/

The first target aim the reduction of marine pollution, a problem that is currently heavily impacting the oceans. Ocean Action Hub in its website reported that the level of nutrient pollution in the water almost tripled since pre-industrial era, problem reflected in the process of eutrophication of oceans. Secondly, but not less important, there is an increasing trend in the level of plastic in the oceans, leading to a negative impact on both the natural ecosystem and marine organisms. For these reasons, this goal is measured by the “index of coastal eutrophication and floating plastic debris density”. Goal 14.2 aims the protection of marine

and coastal ecosystems and is evaluated through the "proportion of national exclusive economic zones managed using ecosystem-based approaches". The third target regards the problem of acidification, which is caused primarily by the carbon dioxide that is produced during the combustion of fossil fuels and then is dissolved in the oceans. This will form carbonic acids that ruined the pH level of water. It is interest of every country to reduce this level of acidification in order to preserve the oceans. The indicator of this third target is though the "average marine acidity (pH) measured at agreed suite of representative sampling stations". Target 14.4 looks at the level and the processes of fishing. Ocean Action Hub reported economic losses for $50 billion per year due to overexploitation and $23 billion pre year due to illegal fishing practises. For the purpose of the goal, indicator 14.4.1 measures the "proportion of fish stocks within biologically sustainable levels". In this case sustainable levels of fish stocks, UN refers to those which are fully exploited or underexploited (abundance must not go below maximum sustainable yield level). The fifth target involves the conservation of at least 10% of coastal and marine areas: usually areas with specific scientific interest, that are rich of biodiversity species, are protected by the law. The indicator for target 14.5 is though the "coverage of protected areas in relation to marine areas". Figure 2.12 shows the share of marine protected waters by country in 2017.

Figure 2.12 Share of protected marine territorials waters



Available at: https://ourworldindata.org/grapher/marine-protected-areas

Target 14.6 is devoted to the fight to perverse fisheries subsidies that promote overfishing. Ocean Action Hub reported that $16 billion are spent every year on this kind of subsidies. The indicator for the goal is "progress by countries in the degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing". The

seventh target looks at the dependence of the economies of Small Island Developing States (SIDS) and least developed countries (LDC) on marine resources. Ocean Action Hub reported that their incomes rely between 7% and 50% on fisheries and tourism. For this reason, UN calls for the support of international community on enhancing them to increase the benefits that they could achieve from these resources. The indicator for this target is "sustainable fisheries as a percentage of GDP in small island developing States, least developed countries and all countries". In order to let SIDS and LDC exploit marine biodiversity to push their level of development, there is a need for scientific knowledge and research capacity: objective 14.a looks at this aspect through its indicator 14.a.1, which is the "proportion of total research budget allocated to research in the field of marine technology". Target 14.b aims the protection of small-scale fisheries who could be disadvantaged by the subsidies that are provided to large-scale ones and can find difficulties to have access on markets. The measure for this goal is indicator 14.b.1, which is "progress by countries in the degree of application of a legal/regulatory/policy/institutional framework which recognizes and protects access rights for small-scale fisheries". The last target related to SDG 14 is regarding the international collaboration on this field and is measured by the "number of countries making progress in ratifying, accepting and implementing through legal, policy and institutional frameworks, ocean-related instruments that implement international law, as reflected in the UN Convention on the Law of the Sea, for the conservation and sustainable use of the oceans and their resources".

2.3 REVIEW OF LITERATURE REGARDING WATER ACCOUNTING AND WATER DISLOSURE

According to the Global Risks Report of 2017 of the World Economic Forum, water-crisis is the third threat that the global population will face according to the answer of 750 members of the stakeholder community. The water crisis, as highlighted previously in the chapter, arises due to an increase in demand and a decrease of supply of water, with climate change even exacerbating the current situation. Projections state that by 2030 the level of demand will exceed the level of supply by 40%. This threat will impact not only the lives of people, but also the activity of businesses. Corporations, doing their activities, are one of the largest consumers of water (Lambooy, 2011). Larson et al. (2012) stated the same result emphasizing that companies belonging to all industries, even with different degrees, need water. Chapagain and Tickner (2012) highlighted that since water is a shared resource, the activity of one user could have a negative impact on the activity of the others and so it is concern of all

(governments, communities, and businesses) to use it in a responsible way. Christ and Burritt (2017) stated the attention around the importance of water in hugely increasing and so the asset should be treated for its value, remembering the complexity of the issue of water availability and its interdependent nature. In the case of businesses, they not only are exposed to risks regarding water for their activities, but also for the ones of the companies belonging to their supply chain. Burritt and Christ (2017) stated that the relationship between water and businesses could lead to a vicious cycle because, on one side they need water is critical for their operations, but on the other side, their activities could have a negative impact on the quality that the others could use.

The World Business Council for Sustainable Development (2012) divided water-related risks into 5 main categories: *financial risk*, which is related to a higher difficulty in engaging new investors that are increasingly interested into environmental issues, *operational risk*, which is referred to higher production costs, *product risk*, which is the possibility to lose market share due to the fact that customer preferences that are driven from the concern of water availability, *reputational risk*, regarding the image of the company and the possibility that the activities of the company could be in conflict with the values of the society, and lastly *regulatory risk*, which is related to the possibility to incur into fees or regulation limitations if the activities of the company are perceived as in conflict with the interest of the community. Not only the quantity of water used have an impact for businesses, but also the quality present issues. It might happen that before using water, companies have to treat it for its poor quality. For this reasons, an inefficient and ineffective use of water is becoming an economic issue that management has to deal with. For this reason it becomes fundamental the adoption of tools that enable the management to have access to data and to evaluate the effectiveness of the company regarding the use of water resources. Christ and Burritt (2017) remarked that "This could be volumetric information relating to the amount of water used in operations, it could relate to resources and stores available for current and future use, or it could be more complex data relating to the various aspects of water quality". The discipline took the name of water accounting, even if there is not a general consensus about the definition of this term. Morrison et al. (2010) put the emphasis of this subject to the management of the risks highlighted above and the implications that the water use have, in particular to reach efficiency. The World Business Council for Sustainable Development (2012) proposed a 5 stage approach of water management. The first step for management is to evaluate the global and local pattern of water for the company: in particular, this step regards the assessment of the impact of external conditions on the company. External conditions could imply geographical, technological, socio-political, or regulatory aspects. The second step regards the

implications of the activities of the company on water, on the sourced used, the processes used to storage it, the management of wastewater and so on. Third step is the assessment of water risks and opportunities: this may require both physical and monetary data. This part is particularly important because there is not a general pattern, but it could vary between different countries and different catchments. The following step that companies should do it the determination of actions to do upon predetermined targets: this imply companies to have personnel with skills regarding planning and budgeting, and not less important to control. Last step is abut the monitoring process and the communication of the performance both internally and externally, in order to evaluate if the action that were taken produced the results expected and to correct and implement what already done in order to maintain an improving trend. At the same time the theme of water gained the attention of accounting researchers which developed a Water Management Accounting (WMA) in extension to the classic Environmental Management Accounting (EMA) that was used since the end of the 20th century. In fact, until recent years EMA was almost ignored in all water management initiatives leading to the result that the tools that were developed until that moment were criticised for being "one dimensional and external focus, past orientation, oversimplification of complex issues, lack of emphasis on future management, and lack of monetary information" (Christ, 2014). Christ and Burritt (2017) reported all the water related initiatives and showed how they were mainly designed for the purpose to increase external stakeholders awareness of the business risks related to water use, with a little space for improving the decisions of internal management. WMA instead is almost entirely devoted to provide support to the management in the decisions related to the 5 categories of risks. Burritt and Christ (2017) remarked that in the early 2000s the problem of water-related tools was that they were designated for collecting physical data, without incorporating monetary values of impacts of companies.

Another stream of literature focused on the importance of water disclosure and its potential drivers. As highlighted by the CEO Water Mandate (2014), corporate water disclosure emerged as one of the most important components of water management practices. According to Freyman et al. (2015) investors, creditors and the regulators of stock markets play an important role to the diffusion of the practise of water disclosure putting pressure on companies. In particular, they promote the practise of divulgating information regarding the exposure that companies has on the previously mentioned water-related risks and the actions that the management took in order to mitigate them. Ben-Amar and Chelli (2018) adopt the institutional theory to test whether institutions have a role in the practice of water disclosure. They adopt the legal system of a country as a proxy of the strength of formal institution,

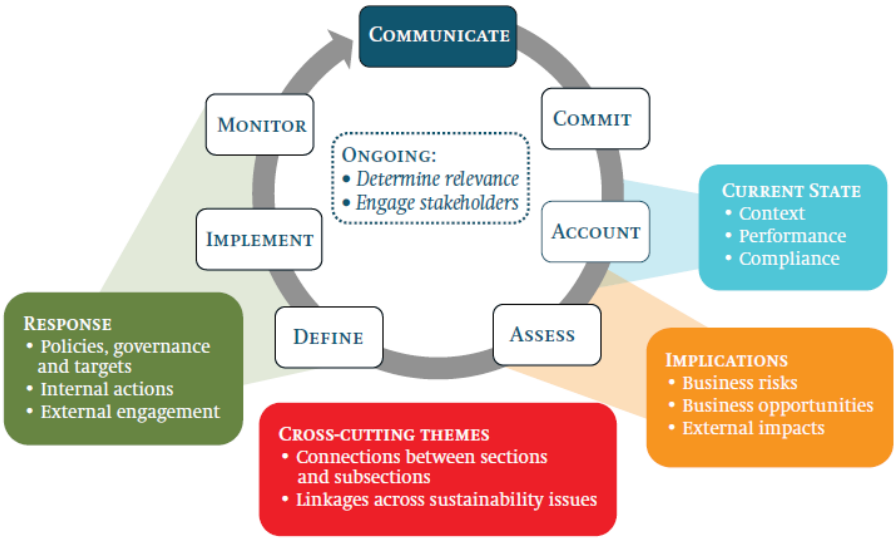
analysing the common law case and the code law one, and the set of values and principles of the society as informal institution. As Peng, Wang and Jiang (2008) highlighted, the culture of the society is the manifestation of these set of values and principles. In particular three elements were taken into account for informal institution: uncertainty avoidance index (UAI), future orientation and societal trust. In this analysis they found that country formal institution is related to voluntary water disclosure propensity and that countries belonging to common law countries are more willing to disclose that type of information than code law ones. This proves that a strong formal institution, which ensures higher level of investor protection, like the common law have a positive impact, while a weaker one lead to a lower level of voluntary disclosure. As regards informal institutions, they found diverse results for common low and code law countries. Under a strong formal institution environment, the informal drivers evaluated have not a significant impact, while in a weaker formal environment the propensity of companies to disclosure voluntary information appear to be related by the informal institutions analysed. In code law countries, results present a positive relationship between water reporting and future orientation and negative relationship with UAI and societal trust. The negative relation with UAI supported the thesis of Hope (2003), according to which a high level of uncertainty avoidance is related to high level of secrecy and opacity into the reporting practices. The negative relation with societal trust level is explained by the idea that if there is a high level of trust in the country, investors tend to believe that corporate reporting is credible and so do not require further information. Hazelton (2013) support the thesis that water disclosure is a human right and for this reason could act as a formal institution and have normative force. Burritt et al. (2016) conduct an analysis to test drivers of water-related disclosure in Japan and found a positive relationship between water-disclosure and size, water sensitivity of the industry and the level of concentration of ownership. A negative relation was found with media exposure and no association was found with cross-listing and profitability.

2.4 INTERNATIONAL CORPORATE WATER DISCLOSURE GUIDELINES

The CEO Water Mandate in 2014 published a set of guidelines in order to create a common approach toward water-related disclosure. The goal is to help companies in defining what to report and to create a common practice that could help a comparability in a context where there are not mandatory requirements. These guidelines are aimed at addressing the complexity related to the water theme since water management practices highly depend on industry characteristics and geographical area. In this sense the guidelines are designed to be

helpful for every sector and every organization. Disclosure addresses the business risks related to water presented by the World Business Council for Sustainable Development in many ways. Firstly, the disclosure process help companies to understand those challenges and to develop appropriate responses. Secondly, it is a tool that could be used to demonstrate their commitment toward the theme and the progresses made by the company to external stakeholders as well as internal ones. This could enhance the possibility to have a better engagement with external stakeholders strengthening the reputation of the firm, attracting new talents, while at the same time increasing the credibility with employees, the community and the government. Figure 2.13 presents the steps of corporate water management processes.

Figure 2.13 Corporate Water Management Processes



Source: CEO Water Mandate, 2014. Corporate Water Disclosure Guidelines. Toward a Common Approach to Reporting Water Issues, Oakland, California.

The disclosure framework identified by the CEO Water Mandate started with the information regarding the water profile of the company, which should present an initial overview of how the company interacts with water, the challenges and opportunities that the company face regarding water, its commitment and the actions adopted in order to manage risks, and lastly quantitative metrics of the overall performance. From this initial part, users are allowed to identify where companies are more likely to have a greater impact and they could use that information to do comparisons between different entities.

One of the most important part of the guidelines is the one regarding what to report. In order to produce a reporting that is effective, companies should understand which are the water-related topics that are most important for their stakeholders: for a company it could be the quantity of water used in relation to water scarcity, for another firm it could be the quality of water or the theme of wastewater, and so on. Once they have understood that, companies need to disclose information regarding *material* topics. The difference between relevant and

material topics is that the former are those that are reasonably important in order to reflect the impacts of company's behaviours, while the latter are the subset of them which are determined to be significant enough to justify their disclosure. Is it clear that the process used to determine both is merely subjective and so it is important that companies disclose their assumption beyond every statement. The process starts with the determination of water-related topics. First step is the choice of the entities to take into account: while a basic approach requires to include the entities owned and controlled, an advanced one could take into account also the related supply chains. Second step is the evaluation of the relevance that water has in its operations. Usually this is done at an industry level, determining the risks to which the sector is exposed and the negative impact that companies could create. According to what literature have found the reported the results in Figure 2.14.

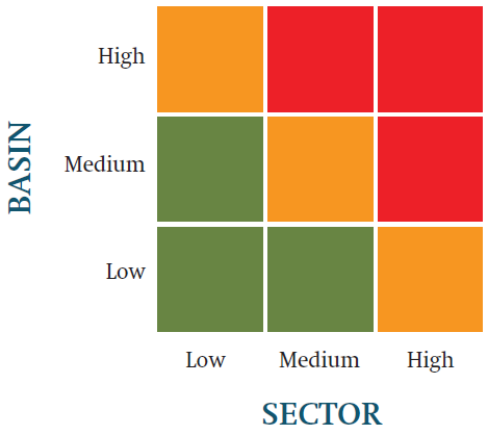
Figure 2.14 Water dependent sectors

Source: Ceres. The Ceres Aqua Gauge: A Framework for 21st Century Water Risk Management, 2011.

Source: CEO Water Mandate, 2014. Corporate Water Disclosure Guidelines. Toward a Common Approach to Reporting Water Issues, Oakland, California.

Based on the risk of the sector and of its basin, a company could identify the level of exposure to water risk with the help of the matrix presented below.

Figure 2.15 Exposure to water risks matrix



Source: CEO Water Mandate, 2014. Corporate Water Disclosure Guidelines. Toward a Common Approach to Reporting Water Issues, Oakland, California.

Companies which belong to red areas are the ones that are more likely to have benefit from investing in the water management process. Once determined its exposure due to the industry and the basin, last step is the evaluation of specific factors that could have an impact on the external environment. The process ends with the prioritization of the topics found in order to determine which of them are the material ones and though must be included in the report.

Specified which should be the process to determine the content of the report, the guidelines specifies which are the areas that ideally the report must include. They are presented in table 2.8. For each area there are identified the practices that could lead to a basic level or to an advanced one. Companies increase their knowledge regarding water management practices with experience so a basic level could be caused by a scares experience or because they do not find necessary to implement the full set of disclosure, because of their size or because they think is it not of interest for their stakeholders.

Table 2.8 Content of water disclosure by different levels

	SUBSECTION	BASIC	ADVANCED
CURRENT STATE	Context	• High-level assessment of basins across a portfolio	• Detailed, location-specific assessment of basins where water challenges are pronounced • High-level assessment of basins in which key value chain actors are located
	Performance	• Total and percentage of withdrawals in water-stressed or water-scarce areas • Percent of facilities adhering to relevant water quality standards • Average water intensity in water-stressed or water-scarce areas (as appropriate) • Percent of facilities with fully functioning WASH services for all workers	• Location-specific performance data: - Water withdrawals by source type - Water intensity - Water consumption - Water discharge by destination type - Water performance in the value chain
	Compliance	• Percent of facilities with a water-related regulatory compliance violation	• Adoption of internal and/or voluntary sustainability standards • Water-related regulatory compliance violations in the value chain
IMPLICATIONS	Business risks	• High-level assessment of risks at a portfolio level	• Detailed assessment of risks based on extensive, location-specific analysis at the facility level • Value chain risks
	Business opportunities	• High-level assessment of opportunities	• Detailed assessment of opportunities • Value chain opportunities
	External impacts	• N/A (legal compliance used as proxy)	• Impacts on water availability, water quality, and access to water resources and WASH services (including human-rights-related impacts) • Prioritizing impacts
RESPONSE	Policies, governance, and targets	• Commitment to water stewardship and human rights to water and sanitation • Goals and targets	• Policies, strategies, and governance • Respecting the human rights to water and sanitation
	Internal actions	• Improvements in direct operations	• Product innovation • Value chain prioritization, engagement, and improvements
	External engagement	• Participation in global initiatives	• Consumer/public engagement and awareness building • Policy advocacy • Place-based collective action

Source: CEO Water Mandate, 2014. Corporate Water Disclosure Guidelines. Toward a Common Approach to Reporting Water Issues, Oakland, California.

CHAPTER 3

RESEARCH METHOD

3.1 CONTENT ANALYSIS METHODOLOGY

Content analysis is a research method which could be used to do a objective systematic analysis of a written document, a verbal record or a visual image (White and Marsh, 2006). It was initially used in 1950s to study mass communication, but during years scholars found it helpful to conduct researches in many fields. Gheyle and Jacobs (2017) stated that it is a useful tool that attempt to determine and extrapolate textual meanings. Krippendorff (2004) define content analysis as "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use". As reported by Wilson (2011), the chosen content is analysed through a separation of it into conceptual blocks that are subsequently coded and evaluated.

There are few steps that are unanimously recognized to be done within a content analysis: unitizing, sampling, coding and, lastly, reporting results. Unitizing process is strictly related to the research question. Carney (1971) define unit as an "identifiable message or message component, which serves as the basis for identifying the population and drawing a sample, on which variables are measured, or which serves as the basis for reporting analyses". Krippendorff (2004) defined three types of units: sampling, coding and context ones. The first category is the one that defines the characteristic that are required to be included in the analysis and so that define the chosen sample. The second class is referred to the ones that are used to separate the content between the different areas that are then evaluated by the researcher. The third group is used to define the limits of the information that are taken into account for the analysis. Krippendorff (2004) found five ways that could be used to separate units: these are valid for each of the three categories of units. The five ways are: physical (which implies a partition based on the time, the length or the size of a unit), syntactical (which is based on the syntax of the unit), categorical (which is based on the belonging of the unit to a particular category), propositional (which implies a division based on propositional forms) and thematic (which divide units between different themes that are treated in them). Once this step is made the analysis goes on with the identification of the sample. There are different methods that could be used to define the sample. One possibility is to choose within the determined population using a random process, another possibility is to adopt a non-random process, or lastly the analysis could involve the whole population. It depends on the characteristics of the research question the determination of the process that could best fit for the analysis. Regarding the decision upon the size of the sample there are not specific rules

that should be used. But, as reported by Gheyle and Jacobs (2017), the re is the general qualitative rule that the more the units that are part of the analysis are rare, the more the sample should be larger. Once the sample is defined the following step is the coding process. One of the most important elements of this step is the identification of clear coding rules, which should also be explained to the readers. The aim of a good analysis is to specify them in the most unambiguous way as possible in order to ensure the reliability of the research. Literature divided content analysis into two categories: quantitative and qualitative. The quantitative approach is defined by a codification of data into a priori defined categories and then the description of the results using statistical tools. What characterize this type of research is the definition of hypothesis and the coding scheme that is defined before the empirical analysis. Instead, a qualitative approach implies the definition of a research question, but there are not pre-defined categories. The analysis conducted in this way started from an open question but can take different ways among the process, the categories are built only through the analysis. (Hsieh and Shannon, 2005). The authors defined a qualitative content analysis as the "research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (Hsieh and Shannon, 2005). This inductive approach, instead of being aimed to inference, usually ends with the use of descriptive statistics that present the results found. In reality there is not a clear distinction between the 2 categories but, instead, content analysis belong a continuum that have the two approaches as extreme points. When the coding phase is ended there is the illustration of results using statistical tools. As said before, some analysis will end with tool that try to do inference from the sample used, in other analysis descriptive statistical techniques are used in order to present the results found in the sample.

One of the most important elements of the whole process is the use of measurement standards in order to present credible results. Since the flexible nature of this type of analysis it could happen that human coding is subject to errors. In order to ensure the trustworthy of the project, it is necessary that some standards are respected. Regarding this point two main concepts have been used: reliability and validity. The first one is usually the most used and deal with inter-coder reliability. The heart of the concept is the fact that 2 or more different researchers should find the same results applying the same coding scheme. According to Neuendorff (2001), an acceptable level of inter-coder reliability is above 90% to all authors, but also a level between 80% and 90% should be fine for most. If this threshold is not satisfied it could be due to a poor coding scheme or due to an insufficient training of the coders. Validity, instead, regards the evaluation of whether the coding scheme used is effective in answering the research question. External validity could be tested through the

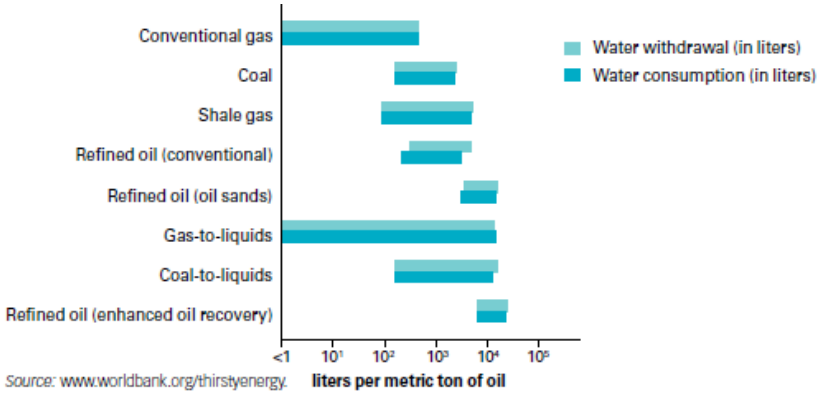
generalizability of the analysis, which means evaluating whether the results found can be applied to other settings. Internal validity, instead, implies the evaluation of whether measures are used in a way that is coherent with the answer of the research question.

3.2 PROCESS USED FOR THE SELECTION OF DATA

The goal of this analysis is to understand how companies use voluntary water disclosure and in particular to understand if there are, inside sustainability reports, information that are in line with the Sustainable Development Goal 6 objectives. So, using Krippendorff definitions, sampling and context units overlaps and are the parts inside sustainability reporting information of companies which are related to the water issue. To do so, it was thought to be most interesting to analyse data which belong to firms that operate into industries that are commonly considered as water-intensive. In the second chapter Figure 2.14 presented a list of industries that, according to the CEO Mandate, are strictly related with water and depend on its use and availability. Among them, the attention was focused on two of them: the energy and the food and beverage sectors.

Regarding the first one Sohns, Rodriguez and Delgado in 2015 wrote an article for the World Bank Group regarding the linkage between energy and water. They stated that there is a double linkage between them. While the first one is needed for the transportation, the treatment and the desalination process of water, the second is at the basis of all the generation processes of energy. Especially, thermal power plants require huge amounts of water in order to conduct cooling processes. At the same time, Sohns, Rodriguez and Delgado (2016) also analyse in detail how the oil and gas sector need water for their operations. In particular they highlighted that even if the companies operating in this field do not consume as much water as other industries do, their demand of water can significantly impact the water resources and create conflicts between different users specifically in some water-stressed areas. As reported by the World Water Assessment Programme (2014) water is fundamental at each step of the oil and gas processes, from extraction to processing. While the consumption of water is a common factor to every energy industry, the level of required water differ from type of fuels. Figure 3.1 reported those different use in quantities.

Figure 3.1 Water use of different types of fuels



Source: Delgado, Anna; Rodriguez, Diego J.; Sohns, Antonia A.. 2016. Thirsty Energy (II): The importance of water for Oil and Gas Extraction. Live Wire, 2016/56. World Bank, Washington, DC

Oil and gas, though, can have a great impact on the water availability and can influence the capacity of other people and other industries to have access to water. For this reason a sustainable water management system is fundamental in order to avoid the situation in which the increasing use that those companies do is a threat for the general supply of water or have a negative impact on its quality due to leaks or inefficient processes used to treat wastewater. For these reasons, an assessment of the uses of water of energy sector is important to evaluate the impact that those firms have on the local context in which they operate.

The second sector analysed is food and beverage. Alkaya and Demirer (2015) found that in Turkey food and beverage industry is the third consumer of water resources among the total industrial consumption, accounting for almost 10% of the total use. As Aivazidou et al. (2016) remarked, water is a fundamental requirement for the entire supply chain of the industry, since it is necessary for the production of the raw materials used for the operations and at the same time water is necessary for the production phase of the final product. For this reason Van den Abeele et al. (2017) stated that the significant water footprint that characterize this sector cannot be easily reduced. Spiess (2014) found that, within food processing industry, water is used to clean the raw materials, it is used as ingredient in many types of products and is used as coolant agent. The increase in population even exacerbate the problem of the water availability: since the demand of food is projected to increase it is necessary that also the supply should increase, and this mean an increasing use of water on which the industry should rely. Moreover, not only the quantity of water available could threatened by the food and beverage companies but also wastewater from the operations throughout the food preparation could be a problem. Weber and Saunders-Hogberg (2018) reported that the process of biodegradation is many times too complex for those effluents and this could lead to the problem of watersheds. Van den Abeele et al. (2017) reported that high volumes of water discharges are produced by the food industry and that this wastewater could contain high

percentages of “organic compounds, nitrogen, phosphorous and heavy metals”. Alkaya and Demirer (2015) found that in Turkey food and beverage industry is one of the highest sectors for its production of wastewater discharges. The capacity of companies to treat its wastewater in order to recycle it also impact the need of them to use new freshwater. The more companies are able to recycle it, the less they will impact the availability of water for other people. For what mentioned the sector was selected for the analysis.

3.3 PROCESS USED TO COLLECT DATA

The reports used to do the content analysis were collected from the Sustainability Disclosure Database, that is directly owned and operated by Global Reporting Initiative. One of the strengths of the system is the detailed description used to classify the companies and also the huge amount of information that is available in the report profile. Moreover, the fact that it is directly managed by the GRI organization gives a higher level of legitimacy. Every organization that has a report included in the database has its personal organization profile section, which allow the users to immediately understand the general context of the specific firm. In particular here users can have a description of the organization and some or all information regarding size, type, listing, sector, country, number of employees, revenues, membership to the GRI community and stock listing code, depending on what type of data the company disclose when registering itself. Between them the most important categories are size, sector and country, which are the ones that could be use in the “Search” section. Information regarding size categorize companies into 3 classes: Small and medium-sized enterprise (SME), Large enterprise and Multinational enterprise (MNE). The EU definitions are applied in order to divide companies into those categories. Organization type information divide them between “private company”, “state-owned company”, “cooperative”, “subsidiary”, “public institution”, “non-profit organization” and “partnership” forms. Listing information divide the organization between those that are listed and those that are not, while for certain types of organization the listing is not possible and so the information is reported as “not applicable”. Sector information categorize firms among their industry, with the classification available in Table 3.1. Country specify where the headquarters of the firm are located. For the country there is also a further information which state whether it is a member of OECD, or is one receiving aids through OECD aid program, or whether it is neither of them.

Table 3.1 Sectors of GRI's sustainability database

- Agriculture
- Automotive
- Aviation
- Chemicals
- Commercial Services
- Computers
- Conglomerates
- Construction
- Construction Materials
- Consumer Durables
- Energy
- Energy Utilities
- Equipment
- Financial Services
- Food and Beverage Products
- Forest and Paper Products
- Healthcare Products
- Healthcare Services
- Household and Personal Products
- Logistics
- Media
- Metals Products
- Mining
- Non-Profit/ Services
- Other
- Public Agency
- Railroad
- Real Estate
- Technology Hardware
- Telecommunications
- Textiles and Apparel
- Tobacco
- Tourism/ Leisure
- Toys
- Universities
- Waste Management
- Water Utilities

Source: https://www.globalreporting.org/media/m22dl3o0/gri-data-legend-sustainability-disclosure-database-profiling.pdf

Then in the page of the organization the is the section related to report publications. Each report page does not only give the link for the direct access to the document but, as for the organization profile, reported various general information related to the report. The most relevant of these information are the publication year, the report type, the adherence level, whether it is an integrated reporting or not, whether there was the input or feedback of stakeholders or experts and the presence or not of external assurance for the document. As regards the report type, there is the distinction between those who applied a version of GRI (with the version used specified), citing GRI (used for reports that directly use the reference to Standards elements but do not satisfy the requirements imposed by GRI Standards or for those which are based on GRI Guidelines but after that the version applied was expired) and Non-GRI (which is used for reports that are not produced in accordance to a version of GRI Guidelines or Standards but treat several sustainability topics reporting on ESG performance).

For the content analysis among all the data, reports related are filtered firstly on the two sectors chosen: food and beverage and energy. The European boundary was chosen. No filter was adopted for the type of the report, so there were taken into account documents in line with GRI, citing GRI and also Non-GRI ones. At the same time there was no selection between Integrated reports or standalone sustainability ones. The final decision was the one regarding which reporting year to take into account and the final choice was to adopt documents that were published in 2019, referred to the 2018 reporting year. Once this selection took place, all the documents that meet those criteria were analysed in order to pick only those who reported on water issues. In some cases even if this new requirement was met, there arose the problem that some of them were written in the national language and not in English. For them, the reports were searched on another database (Corporate Register) or the website of the organization was consulted in order to find the document in English. Where it was not found an English report the company was eliminated from the sample. After all these screening processes the final sample was found, and it counted 56 companies for Energy sector and 40 for the Food and beverage one (Table 3.2).

Table 3.2 Companies of the sample

ENERGY	FOOD AND BEVERAGE
Alteo Group	A.G. BARR
BP	AGRANA Group
Cairn Energy	AmRest
CEZ Group	Associated British Foods
CEZ Romania	Berentzen-Gruppe
Eesti Energia	BONDUELLE SAS
Energetický a průmyslový holding (EPH)	Borsodi Sörgyár Kft.
ENGIE	Carlsberg Group
Eni	Coca-Cola HBC AG
EP Infrastructure	Coca-Cola HBC Austria GmbH
Equinor ASA	Coca-Cola HBC Polska
FGC UES (Federal Grid Company of United Energy System)	Coca-Cola Hellenic Russia
Fortum	Coca-Cola Hungary
Galp Energia	CONGALSA S.L.
Gasum	Damm
Gazprom	Danone
Gazprom Neft	Diageo
GD ENERGY SERVICES GROUP	Dukat Croatia
Grupa Lotos	Elior
Grupo Unión Fenosa Gas	Emmi
Hellenic Petroleum	Fazer Group
INA Group	Ferrero International
IWB	Fleury Michon
KONCAR	Glanbia
Lukoil	Greencore
Lundin Petroleum	Heineken Ireland
Marquard & Bahls AG	HiPP GmbH & Co. Produktion KG
MOESK (Moscow United Electric Grid Company)	HKScan Corporation
MOL Group	Julius Meinl
Motor Oil Hellas	Kerry Group
NOVATEK	Kompania Piwowarska
OGK-2	Lantmännen
OKQ8 Scandinavia	Lindt & Sprüngli
OMV	Nestlé
OMV Petrom SA	Nutreco
PGE Polska Grupa Energetyczna	Orior
PKN Orlen	Ottakringer Getränke AG

Pohjolan Voima	Palsgaard
Premier Oil	Staropramen
RAG Austria AG	Vion
Romanian Power Grid Company - Transelectrica S.A.	
Rosenergoatom	
Rosneft	
ROSSETI	
Royal Dutch Shell	
Sakhalin Energy	
Scatec Solar	
Siemens Gamesa Renewable Energy	
State Atomic Energy Corporation Rosatom	
Sungevity International	
TAURON	
Tullow Oil	
Unipro	
VERBUND	
Wärtsilä Corporation	
Wintershall Holding GmbH	

3.4 WATER DISCLOSURE INDEX

In order to enable a comparison between the two different sectors a water disclosure index was developed while conducting the content analysis. The quantification given by the index could also allow to have a better understand of how each company's disclosure of water issues and to immediately find the areas in which they do well and where they have to improve singularly. As a sector, instead, the quantification given by the index allow to spot if there is an overall lack in the communication of some of the areas and to identify on which set of information the two water-intensive industries focused their attention. This, seen from a general point of view, could also organizations, such as GRI, that develop standards of communication, to find improvements for their rules. The assumption behind the choice of two sector that highly depend on water is that ì, if for them it is a fundamental resource, they should be the ones that are more interested in the issue and so the ones that are more willing to measure their impact, develop good water management practices and communicate their commitment toward the theme.

The index is developed starting from the one elaborated from Burritt, Christ and Omori (2016) for their analysis in the Japanese context. They found the 24 parameters in order to measure the water-related disclosure:

- Measure water use
- Assess water risks
- Consult stakeholders
- Engage supply chain
- Water statement/policy
- Water goals and targets
- Quantitative target
- Target water use
- Target wastewater
- Best available technology
- Water risk in decision making
- Measure and report performance
- Report freshwater use
- Report wastewater quality
- Report wastewater volume
- Report water recycling
- Report in absolute value
- Report in normalized value
- Trends reporting
- Regional/facility-based reporting
- Use GRI
- Strategic partnership
- Continuous improvement
- Third party audit of water data

The authors based this index on the one that was firstly developed by Morikawa et al. (2007) adding to it the "third party audit of wate data" parameter and removing "Report both normalized and absolute value" as it is already addressed in two standalone parameters. Morikawa et al. (2007) elaborated this model identifying that these measures fully reflect the activities that characterise the water-related profile of an organization. According to them companies should measure water use and the wastewater that is discharged after its utilization

regardless of whether to publish it publicly or not. This step it is at the basis of the evaluation of associated water risks and the prioritization of water management activities. Another important part of the water assessment is the identification of key local issues regarding water resources. Operations in high risk areas require effective management activities in order to understand and deal with potential risks for the company. Another theme that it important regarding the water profile of a company is the engagement with stakeholders which are interested in the water issues: a strong relationship with them could allow the firm to anticipate issues and prevent future risks. At the same time also the relationship with the supply chain could serve as a deterrent for minimizing future water-related risks. Another important part of water disclosure is the one related to the policies of the management in relation to the issue and of extreme importance there is the set of targets and goals: this could help the company to have a clear path in mind to follow and to have regular check to understand if the policies taken had a positive impact or were ineffective. Not less important, how company's management take into account the water issues could be as important as the policies itself. Best available technology can be assessed in order to minimize the risks related to water availability that is necessary to conduct daily operations. The disclosure of measures of water use, particularly if detailed through the historic path could increase the level of transparency of the company in the eyes of stakeholders. And the creation of strategic partnership could have a significant role in the improvement of this performance because local partners could better address specific local problems for the firm. Lastly, a real commitment toward continuous improvement could have the company in the protection of its operation from unexpected innovations. With these assumptions, the 24 parameters presented above were created to measure the presence of such information. Burritt, Christ and Omori (2016), in their analysis, evaluated each parameter with 0 or 1 depending on whether it was addressed in the report of the firm or not. This approach was elaborated in this analysis through a more detailed quantification since the distinction between just 0 and 1 was though as too superficial. For this reason in the quantification of this water disclosure index, each parameter could take the vale of 0, 1 or 2. In order to have a clear code rule to assign the value, the 24 parameters were classified inside the subsections of The CEO Water Mandate (2014) previously reported in Table 2.8. This allows to then assign a value of 0 where there was no disclosure about the parameter, 1 where it is treated with the "Basic" approach and 2 where the disclosure is in line with "Advanced" requirements. The CEO Water Mandate document is very detailed in giving not only the general requirements for being classified in Basic or Advanced but gives also further explanations with practical examples. Moreover, for some of them specific rules were decided: to the parameters that measure targets and

performance, the value given is 0 where they are no reported, they have 1 where the disclosure is only qualitative, and they have 2 where they are quantified in the report. For the parameter “Quantitative target” ,since this classification could not be applied, the value could only be 2 where they are present and 0 where not. Likewise, also the parameters “Use GRI” and “Third Party Audit” are measured with 2 where the criteria is met, while with 0 where it is not.

The recording units analysed were all the sentences, tables, graphics related to water issues inside the document disclosed by the company.

In order to ensure the reliability of the analysis, the coding process was done simultaneously by me and by another external person to which the coding scheme was fully explained. To be the most aligned as possible, some examples were initially done together. When the results were confronted it was found that they were the same in the 88% of the cases, percentage which gives a good level of reliability. Where results were different, a discussion was used in order to find the most reasonable agreement.

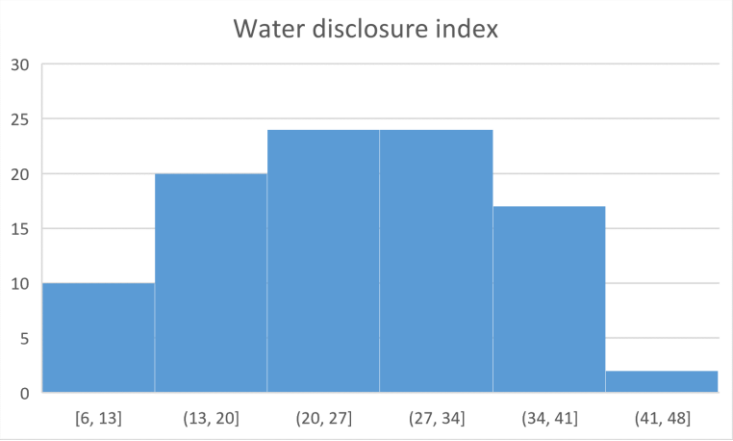
CHAPTER 4

RESULTS AND CONCLUSIONS

4.1 RESULTS ON THE WHOLE SAMPLE

The index for water disclosure within the sample of 96 companies presents a very heterogeneous situation as represented in Figure 4.1. There are 10 firms which disclosure few information regarding water issues and have a total value between 6 and 13. Then there are 20 companies which reached a total score that is between 14 and 20, which is still representing a basic representation of the water profile of the company. The two most populous classes are the ones of scores between 20 and 27, and 28 and 34, which together count for the 50% of the total sample. Companies that belong to the second of the cited groups are the ones that are sufficiently treating the issues: some of them have a detailed disclosure regarding some of the topics while leaving unaddressed some others, some others without being specific in their disclosure are communicating, at least qualitatively, a sufficient level of information. Organizations that totalized a score between 35 and 41, which represent the 18% of the total sample, produce a water disclosure that is at a good level, reflecting a certain level of maturity of water management practices. Finally, there is only one fir that have a score that is above 41, which state for an almost perfect level of disclosure. The mean of the whole sample is 25.23, which represent that these companies does not already reached a high level of maturity regarding the water management disclosure.

Figure 4.1 Water disclosure index

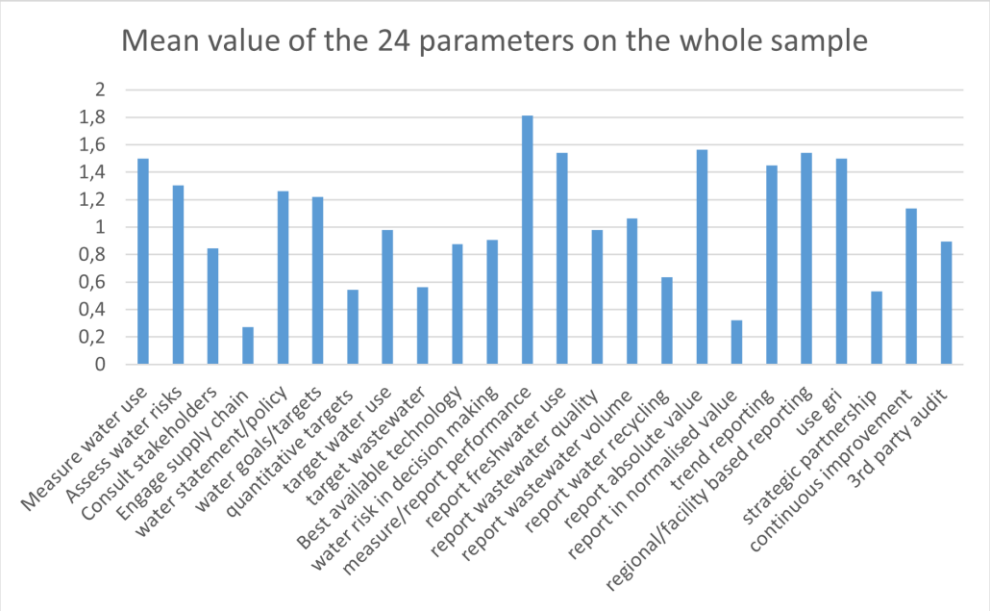


Source: personal elaboration of data

However, the total score gives just a partial picture of the situation. Figure 4.2 shows the mean value on the total sample of firms of each of the 24 parameters used. The highest is the one regarding the measurement and the reporting of the performance of the company. The high level of this parameter indicates that most of the companies do measure how they deal with water and disclose that information quantitatively. Most of the other parameters which

scored a high value are related to the performance of the company: in particular, the sample shows that the most diffused information are the one regarding the use of freshwater, specifically in absolute value and with a presentation of the historical trend. Two other parameters totalized a high score and give a useful insight toward the practise of water disclosure. Companies belonging to this sample usually disclose information using GRI Standards and with a focus on regional or facility-based approach. As regards the ones that totalized the lower scores, the lowest is "Engage supply chain", which have a mean of 0.27. This result shows that companies usually does not report a commitment toward water improvements at a supply chain level, but instead report just on their own attitudes. This is confirmed by the fact that the third lowest measure is "Strategic partnership". This fact confirm the fact that the companies do not show a high level of maturity regarding water reporting. Between these two last mentioned parameters there is "Report in normalized value", which read in relationship with the high level of "report in absolute value", mean that companies prefer to report on total values and not with the ratio of water used to produce a single unit of output.

Figure 4.2 Mean value of the 24 parameters



Source: personal elaboration of data

Another important fact that emerges from the sample is that most companies do not disclosure particular targets regarding water management. This is particularly evident from the scores of quantitative targets and targets regarding wastewater, while there is little higher evidence of disclosure regarding targets for water use, even if usually they are more qualitative than quantitative. Figure 4.3 shows the adoption of quantitative targets in the sample's companies: 73% of the companies do not set or disclosure publicly them. An interesting issue emerges from this distinction: if analysed separately the part of companies that present evidence of

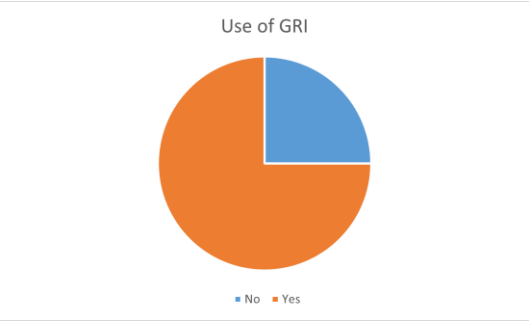
quantitative targets have a significant mean of the total score compared with the ones that do not. The mean of the water disclosure index within companies with this data is 31,92, while the mean of those without is 22,74. This could suggest that firms that set and disclose quantitative targets are the ones with a higher maturity of water-related management activities and though the ones that result in consistent higher level of the index.

Figure 4.3 Quantitative targets

Source: personal elaboration of data

At the same time there is another element that seems to be a signal of a higher level of the water disclosure index: this is the adoption of GRI Standards. AS Figure 4.4 shows, in the sample used 75% of the companies produce the sustainability report or the sustainability-related part of the integrated report following those guidelines. The difference in the mean value between the part of the sample that follows GRI and the part that do not that is significant: it is 19.75 for those the reports that are not produced in line with GRI requirements and it is 27,06 for those who do.

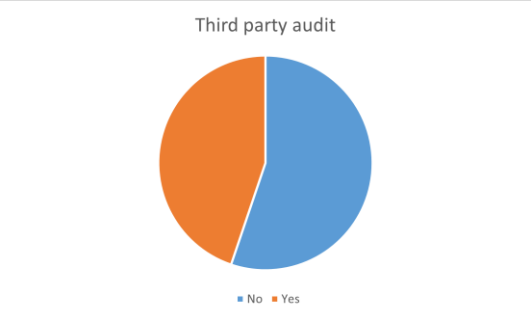
Figure 4.4 Use of GRI



Source: personal elaboration of data

Linked to the adoption of GRI seems to be the third party audit of water data: almost all of the report that are not produced in line with GRI requirements do not match the audit requirement too. But the relationship is not biunivocal since in the whole sample the percentage of report that is audited and that the one that it is not is very close, as represented in Figure 4.5. Also in this case the difference between being audited or less, seems to be a predictor of the level of the final value of the water index: the mean for those that are audited is 29.86, while it is 21.47 for those that are not.

Figure 4.5 Third party audit of water data



Source: personal elaboration of data

Regarding the other parameters what emerge is that 91.67% of the companies disclose information regarding water use, of which 58.33% with an advanced approach, while 33.34% just basically. Water risks are assessed by the 42,71% with a basic level, while with an advanced approach by 43.75%. But as regards the inclusion of those risks into decision making processes just 26 companies of the sample do it precisely, while 35 do it basically and 35 do not report anything regarding the topic. Consultation of stakeholders is done mainly with a basic approach since more than the 55% of the companies have a score of 1. Water statement/policy and water targets/goals follow a similar path since for both more or less the 65% of the firms score 1 point. Regarding the second of the two parameters this means that in most of the cases goals and targets are set just qualitatively and not in numeric objectives. . As a confirmation of this data, commitment toward continuous improvement is usually declared on qualitatively, with a 60% of the sample that score 1 in this parameter. For all these parameters results show that very few companies do no state anything regarding them. Best available technology is mentioned in the 64.58% of cases, usually without a detailed disclosure. As regards wastewater, evidence show that in most of the cases or it is treated in an advanced way or it is not mentioned at all, for both the quality and the quantity dimensions. Interesting results are found for water recycling: in the 62.5% of the cases the argument is not addressed at all.

4.2 RESULTS BY INDUSTRY SECTOR

An analysis of the two industries separately could give better insights regarding how water disclosure is addressed differently in two different water-intensive sectors. As regards the Energy sector, the mean of the water disclosure index is 25.8 within the subsample of 56 companies. In particular it was found that the most populous range of values is the one that goes from 29 to 36, in which the 41% of the companies rely. Then there is the 23% of the companies that totalised a score between 22 and 28, a 20% that is between 14 and 21. Lastly, there are 4 companies with a very good score which is equal or above 37 and 5 companies

that have a very negative score below 13. Figure 4.6 show the value that each of the companies reached.

Figure 4.6 Water disclosure index (Energy sector)

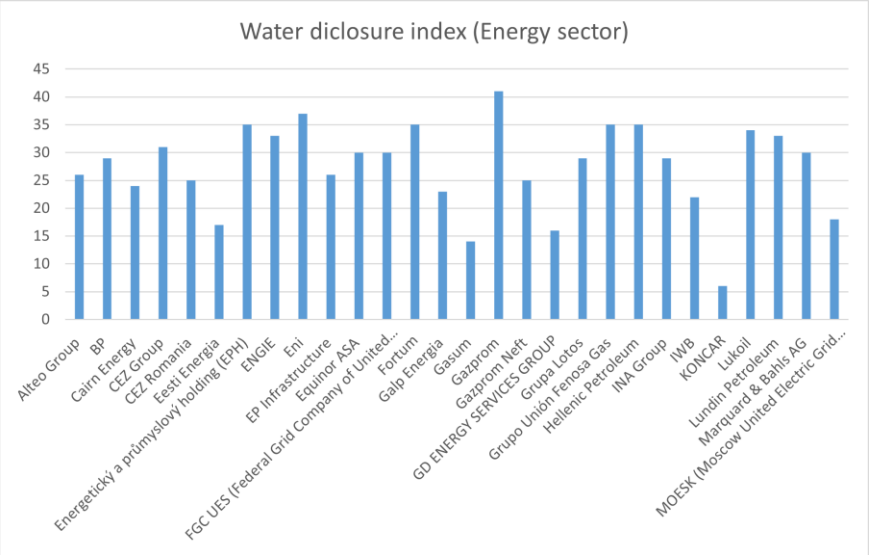
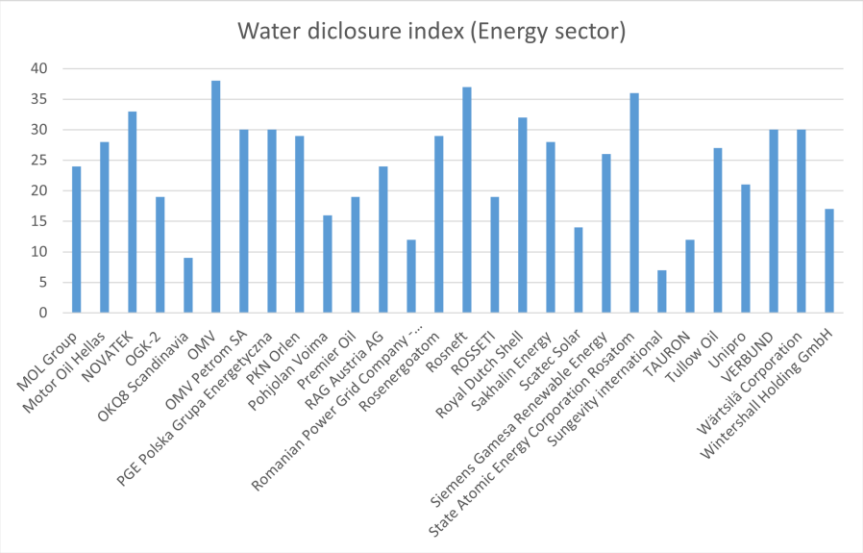


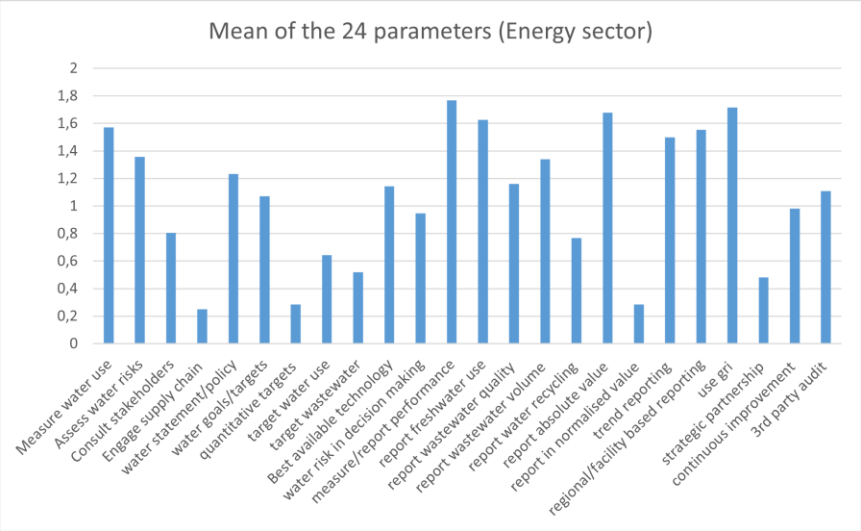
Figure 4.6 Cont. Water disclosure index (Energy sector)



Source: personal elaboration of data

To understand where the sector perform well and where not, it is necessary to analyse the value of each of the 24 parameters separately. Figure 4.7 presents the value of the mean for each of them. The highest value is the one regarding measure and report of the performance of the company. The other values that totalised a very high score give an insight of which is the tendency of water disclosure in the Energy sector: most of the reports are produced following the requirements and the Standards of the GRI, most of them regarding the performance focus their attention more on the use of freshwater more than on wastewater or water recycling, and the data are presented in more than 80% of the cases in absolute value, while normalised values are used very few times.

Figure 4.7 Mean of the 24 parameters (Energy sector)



Source: personal elaboration of data

Very negative evidence, instead, was found regarding the engagement of the supply chain, in which in more than 80% of the companies was not addressed at all. It was mentioned basically in just the 10% of the case, while it is treated with extensively by only 4 companies. It is the sign that among the energy sector water issues are not faced with a common approach, but water management is still treated by companies individually in most of the cases. The industry also present a lack of evidence for quantitative targets that the management set for the conduction of daily activities in relation to water issues. Just the 14% of the companies disclose information regarding this topic. Instead the parameter "Water goals/targets" scored a men value that is slightly above 1, meaning that companies in the sample do provide information regarding their objectives related to water management but mainly qualitatively and not in a detailed way. This parameter in fact is close to the one "water statement/policy", which is not addressed at only in only 3 reports, but in most of the cases companies do not reach the requirements to be classified as "advanced" regarding the specific topic. Moreover, evidence show that companies tend to disclose targets which are related to water use more than to wastewater. As regards the effective performance 91% of the firms measure the use of water, in particular as regards freshwater use. The mean score is well above 1, meaning that it is measured and disclosed in the report in quantitative terms. The score is slightly lower for wastewater quantity, with 41 companies that mentioned this element in their report. Between them 33 reach a score of 2, which means that disclosure is not only most of the time given quantitatively but is also detailed between different geographical areas or different facilities. Wastewater quality present a peculiar evidence: in the 50% of the companies it is disclosed with a very detailed approach that distinguish between different types of wastewater, at the same time in the 34% it is not mentioned at all.

In the remaining part it is disclosed basically at a company level, without much information. Disclosure regarding water recycling, instead, is in the majority (57%) of the cases absent, while it is in very few cases only qualitative and in the remaining 34% quantitative. Information regarding the water performance of the companies are reported using the trend historical path unless in 11 companies. Trend reporting, when present, is many times detailed and very few times it is presented at a general company level. Related to this the energy sector present a quite good vale for the parameter "regional/facility based reporting", which mean is above 1.55, signalling that the majority of the companies do not provide information at a company level but divide data between different area of operations or facility. A high value in this parameter mean that companies could compare the use of water that its activities imply in a region with the specific characteristics of the availability of water in that place and a better management of the risks that water scarcity could create to the company. Related to this the 87.5% of the companies disclose information regarding the assessment of water risks. The CEO Water Mandate divides risks within two categories for businesses: risks that arises due to the operations made by the company in order to create its product or deliver its service and risks that arise due to the conditions of the basin. The basic disclosure, which require companies to disclose an overview of their exposition to water risks at a company level, was found on the 39% of the cases. The advanced disclosure, instead, requires companies to present information regarding exposure to risks with a location specific approach and was adopted by the 48% of the firms. As regards the disclosure of information regarding how water risks fit into decision-making processes, results show that in the nearly 70% of the cases in the report there are evidences, but in most of them information are at a company level, which is associated with a basic approach. Consultation of stakeholders regarding water issues could be a very powerful tool in the hands of the managers in order to anticipate future risks for the company. In the Energy sector, results for this parameter were found to be quite disappointing. In the 60% of the cases it is done briefly and usually just to understand how much they think was is a material element for the operations of the company. In another 32% of the cases the topic is not addressed at all, while only in the 8% of the cases it is done in a detailed way. Best available technology totalised a value that on average is slightly above 1, with a 20% of the subsample that do not treat at all the topic in their report. Disclosure is in most of the cases done with a basic approach, meaning that it is not specified taking into account location-specific features but is it made at a company level. In the same way, for commitment toward continuous improvement it was found that is addressed mainly in a qualitative way, since the usual absence of quantitative targets, and it is specified with a disclosure of manager attitudes toward possible improvements also related to new available

technology that could enable the firm to conduct its operations in a more sustainable way. Related to this there is negative evidence in the sector regarding the creation of strategic partnerships both at a company and at a location-specific level. This part of information is very frequently absent at all or it is just mentioned briefly: only the 9% of the companies in the subsample were able to match the requirements to be defined as advanced. GRI Standards were used by the 85% of the companies, with a significant difference in the mean between those who follow GRI and those who do not: it is 20.25 when GRI Standards were not used, while it is 26.7 when they were. Last element of the analysis regarding the energy sector is the audit of water data from a third party, which was found in 56% of the cases. Also in this case a significant difference was found in the mean which is 22.04 where data are not audit and 28.67 when they are.

Second sector of the analysis is Food and Beverage. Figure 4.8 shows the value of the water disclosure index for the 40 companies used as subsample. The mean of the value is lower than the one of the energy sector and is 24.45. The variance in this industry is higher than the one, indicating than companies have a value that in the 65% of the cases it is or below 20 or it is above 30.

Figure 4.8 Water disclosure index (Food and Beverage sector)

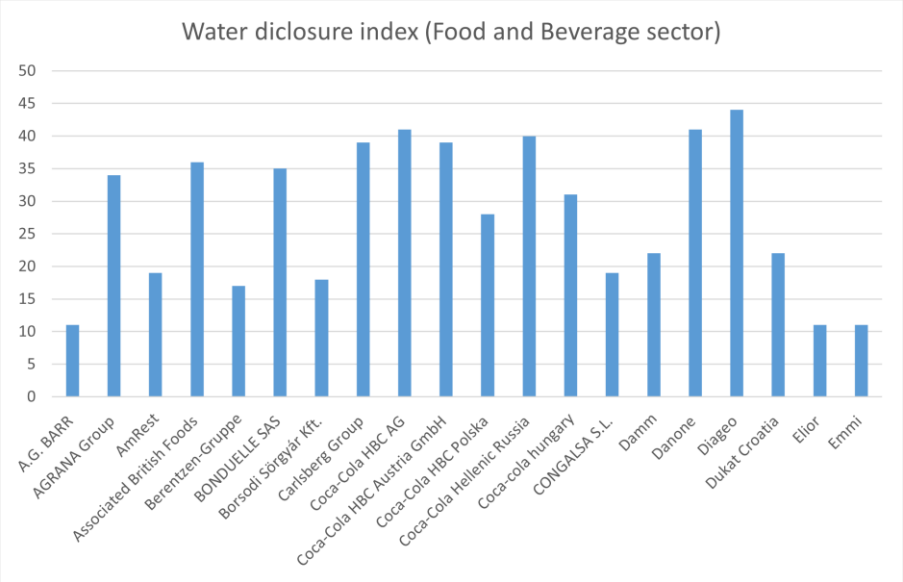
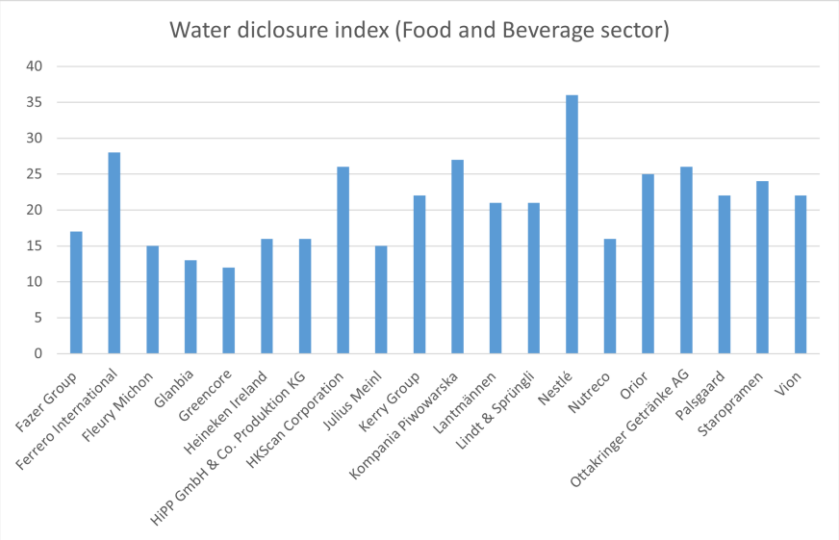


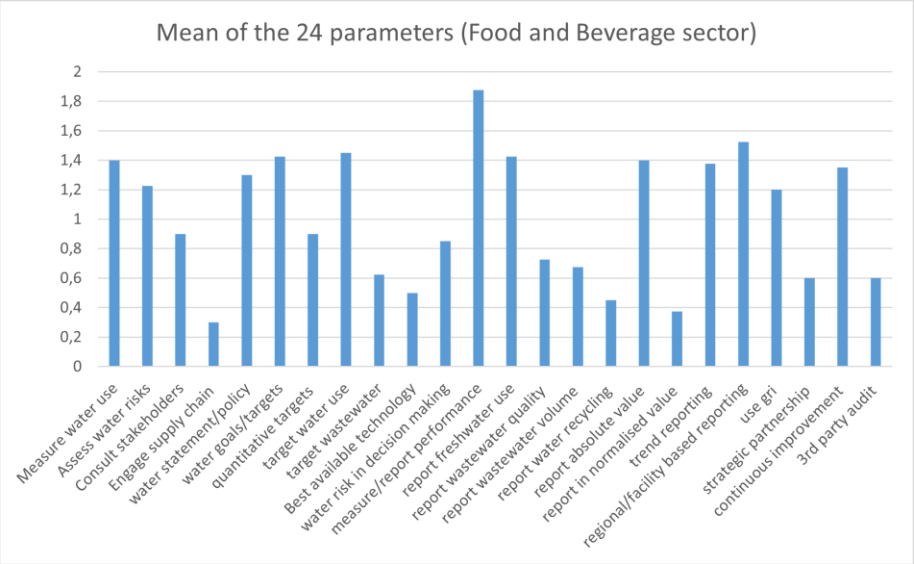
Figure 4.8 Cont. Water disclosure index (Food and Beverage sector)



Source: personal elaboration of data

A deeper analysis of the value of the mean of each of the 24 parameters gives better insights toward the attitudes that companies belonging to the sector have: Figure 4.9 show these results. As for the energy sector the highest value is reached by the parameter regarding the measurement and reporting of the performance of the company. Each of the firm belonging to the sample got the maximum points for this topic except 3 of them: among these, 2 companies do not address at all any information regarding the performance, while 1 give just qualitative information. The reason behind the fact that the 2 companies do not provide any information lies behind the fact that it was the first time that they produced public information regarding the topic and in both it is specified the commitment toward the disclose of this type of information from the following year.

Figure 4.9 Mean of the 24 parameters (Food and Beverage sector)



Source: personal elaboration of data

As regards the other parameters, the second one for mean value is “regional/facility based reporting”, which show that companies are detailing their disclosure not at a company, level but are specific in analysing their information for location or facility issues. A difference with the energy sector previously analysed, this industry show higher values for targets. The most significant difference is specifically in the set of quantitative targets: for this industry the value of the mean of that parameter is close to 1, which is signalling that about half of the population of the subsample present disclosure of targets set in quantitative terms and not just in a qualitative way. Also in this industry instead, targets are more related to the use of water more than on wastewater treatment. Each of the company of the subsample disclose at least qualitatively a goal regarding water use, while as regards wastewater the 30% of the firms do not mention any specific goal. “Water goals/targets” parameter score a value of the mean that is close to 1.5, with just one company which do not address at all the topic. Disclosure is by the 45% of the companies conducted with an advanced approach, which imply that information are specified but there are also regarding managements attitudes and the related strategies that were set in order to follow the path toward the goals. In the 52.5% of the cases companies got just 1 point, which means that goals were stated explicitly but in most of the cases qualitatively and not with the details of how the company is going to reach the goals. Linked to this parameter is the one that measure the presence of information regarding water statements and policies. This is more general than the previous one and is related to the attitudes of the management toward water management activities. The score of this parameter is on average slightly lower than the previous one, but is close to 1.3, which mean that all the companies except for 1(the same as for the previous parameter) disclose information, at least basically, on how they approach water issues. A confirmation of what said could be found from the parameter that measure the assessment of water risks, which have a value of the mean that is very similar to the previous mentioned one. The companies that do not specify information regarding this topic are the 12.5%, while the 37.5% present information regarding risks that are assessed at location or facility levels and the remaining 50% assess them at a company level. How companies incorporate water risks into decision making processes, instead, present a different set of results: 45% of the firms within the sector do not disclose information on how the management take into account those data. The remaining part of the sample is equally distributed among them which publish information at a company level and those who differentiate information for the conditions of different geographical area and the related difference in water stress situation. The consultation of stakeholder as well as for the energy sector is mainly done with a disclosure that match the basic requirement of the CEO Water mandate and typically regards the evaluation of the materiality of water in the opinion

of stakeholders. In just the 15% of the cases it is more detailed and specifies how stakeholder are incorporated in the water related policies and attitudes of the firm. The engagement of the supply chain as well as the creation of strategic partnership are one of the weak point of the disclosure of the sector. In most of the cases both are not mentioned at all but there are few cases (specifically the companies part of the Coca-Cola group) in which the topic is addressed through the initiatives that the companies promoted in order to collaborate with external organizations that could lead to a more efficient use of water resources and a sensibilization of the topic. Commitment toward continuous improvement is a theme that is diffused among the reports of Food and Beverage industry, just 2 companies do not address at all the topic. But is must be said than in more than the 50% of the cases is it just mentioned in a qualitative fashion. Differently from the previous sector, best available technology do not have many space in the voluntary disclosure: the mean of the value is 0.5, since only 2 companies totalised the score of 2. This is a signal that companies do not see in advance of technology a way in which they can improve their use of water. This could be explained by the fact that for the type of product that in which is specialised the sector have a specified recipe that must be followed and there is not much space to differ from it. As regards the performance of the companies evidences were found that most of the companies measure the use of water and most of them do it in a quantitative way. Freshwater use is the most diffused information, with the 95% of companies disclosing this type of data. Between them the percentage of firms that do it at a company level or the ones that measure it disclosing information divided for facilities is almost equally, sign that there is not a general path, but each company do it according to the resources allocated for this type of activity. Typically, the ones that do it specifically at a facility level are the biggest ones. Information regarding wastewater is far rarer: wastewater quality is addressed by the 50% of the firms, and this percentage is slip almost equally between those who report for different types of wastewater and those who disclose the information in a single measure. Wastewater quantity is even more rare since only the 45% of the firms published this data, but when treated it is usually disclosed distinguishing between different facilities and not at a company level. Water recycling is mentioned by only 25% of the companies, with 5 organization that address the topic only in a qualitative way and other 5 that disclose also quantitative data regarding this activity. As for the energy sector, data are provided more in absolute value than in a normalised one. Moreover in the 87.5% of the cases data are reporting with the historical trend. GRI Standards were used by the 60% of the companies, percentage that is lower than the one of the energy sector, but similarly with the results of that industry the mean significantly vary between them with requirements of GRI Standard and those who do not follow them: in the first case the

mean is 27.75, in the second case it is 19.5. Lastly, as regards the audit of water data by an external part only for the 30% of the companies there was found an evidence. In this case the difference between those who are audited and those that are not is even larger: it is 32.6 in the first case, while it is 20.9 in the second one.

4.3 RESULTS BY MACRO-AREA OF THE "CORPORATE WATER DISCLOSURE GUIDELINES" CLASSES

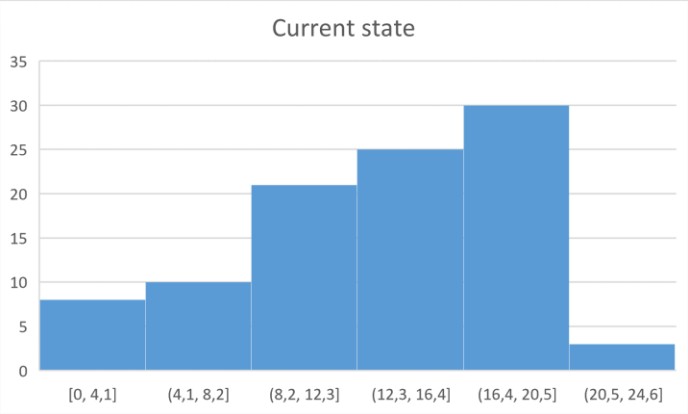
The CEO Water Mandate in its "Corporate Water disclosure guidelines" identified three areas that should be addressed by companies when publishing information regarding the topic: the three areas are *Current state*, *Implications* and *Responses*. For each of these three topics where identified. Current state is made up by *context, performance and compliance*; implications is composed by *business risks, business opportunities and external impact*; lastly, responses are measured with *policies, governance and targets, internal actions and external engagement*. In order to analyse the data of the sample for each of these areas, the 24 parameters were firstly categorised into the presented scheme.

The "*Current state*" area involves 11 of the 24 parameters which are divided as follows:

- *Context* is measured by only one parameter, which is "Regional/facility based reporting";
- *Performance* is measured by 8 parameters, which are "Measure/report performance", "Report freshwater use", "Report wastewater quality", "Report wastewater volume", "Report water recycling", "Report in absolute values", "Report in normalised values" and "Trend reporting";
- *Compliance* is measured by 2 parameters, which are "Use GRI" and "Third party audit of water data".

The maximum value that the Current state area could achieve is 22, Figure 4.10 shows results dividing the score of the companies inside different intervals. As could be noted the most populous class is the one which incorporates firms with a score between 17 and 20, followed by the one between 13 and 16 and the one between 9 and 12.

Figure 4.10 “Current state” value



Source: personal elaboration of data

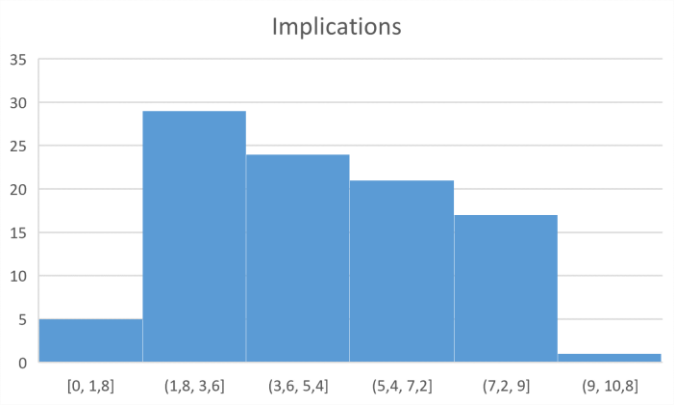
The value of the mean for this area is 13.30 for the whole sample, if the two sectors are considered separately the energy sector present a higher value totalising a mean of 14.5 in front of the 11.63 of the Food and Beverage industry. Since context it is measure by just one parameter the considerations that could be made for it are the same that were presented for that parameter both at the level of the whole sample and also taking into account the differences between sectors. Moreover the two sectors do not present a significant difference between the two industries, in which the value of the mean is almost the same. As regards performance, on the whole sample the mean value is 9.4 out of a maximum value of 16. In this case the energy sector present more positive evidences in its disclosure, with a value of the mean that is 10.13 compared to the 8.3 of the Food and Beverage industry. At the same time, the percentage of firms that present very negative (below 4) are for the 75% belonging to the Energy sector. But since the two sectors present a significant difference in the number of companies belonging to the subsample, the absolute term do not have much sense. Looking in relative terms, in the Energy sector the 11% of the firms reached a score that is below 4, while in the Food and Beverage sector this percentage is less than the half. As regards compliance the two sectors present different scenarios. As a whole, the sample present a mean of 2.4 for this area, but the value give much more interesting insights if looked at a sector level. First of all there is a significant difference in the mean: it is 2.82 (70% of the maximum available score) in the Energy sector, while it is 1.8 (45% of the maximum available score) as regards Food and Beverage. This difference could be explained looking even into more detail the data: 50% of the companies of the Energy industry match both the requirements of this area, while in the second industry only the 27.5%. Secondly, in the first case only the 9% of the firms do not satisfy none of the two requirements, while in the second case the percentage goes up to 37.5%.

Second area of the "Corporate water disclosure guidelines" is the ones that involve *Implications*, which is measured by 5 parameters, divided as follows:

- *Business risks* are measured by 2 parameters, which are "Assess water risks" and "Water risk in decision making";
- *Business opportunities* are measure by only 1 indicator, which is "Best available technology";
- *External impact* is measured by 2 parameters, that are "Water goals/targets" and "Strategic partnership".

The maximum score that this part of the disclosure could get is 10 points; Figure 4.11 shows how the population is divided into different intervals. In this case the most populous class is the one that include a total score which is 2 or 3, which represent the 30% of the total population. Second most diffused class is the one of scores 4 and 5, which is composed by the 25% of the total firms. Then, 22% of the companies got a score which is 6 or 7, 17% between 8 and 9 and 5% got 0 or 1 point. Lastly, only 1 company reached the maximum score.

Figure 4.11 "Implications" value



Source: personal elaboration of data

The value of the mean regarding Implications is 4.83, with no big differences for the two sectors: Energy has a mean of 5, while Food and Beverage's one is 4.6. Business risks area is fully addressed in the 25% of the cases, equally divided between the two sectors. The value of the mean for this category is 2.31 among the Energy companies, while it is 2.1 for the ones belonging to the other industry. The topic is not addressed at all in the 12.5% of the cases, percentage which is the same for both of the sector if analysed separately. Since the two industries are both water-intensive the assessment of water risks and its inclusion in the decision-making processes are very important themes and so it was expected that the value of this topic would have been higher. In particular evidences for the Food and Beverage sector highlight that many times the total value of this area it is or very good (4 points) or it is very bad (0 or 1 point). As regards business opportunities, since they are measure but the only

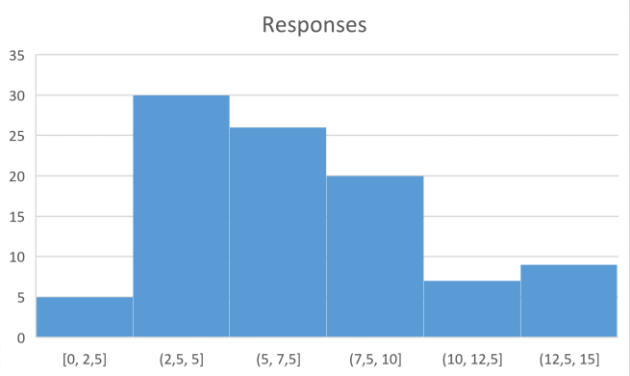
"Best available technology" parameter, results and considerations are that ones that were presented previously for the single parameter both for the case of the sample as a unique or the analysis of the 2 cases separately, as for the case of Context. Lastly, external impact is the one that singularly present the worst results: out of a total possible score of 4, the value of the mean is 1.75. In this field the Food and Beverage industry present better results with a mean of 2, while it is 1.55 in the Energy case. Results are very bad especially in that industry where none of the firms was able to get the maximum score and at the same time half of the companies got 0 or 1 point. The situation in the Food and Beverage industry is slightly better, where 20% of the subsample got 4 points and none scored 0. A special mention must be given to the companies of the sample which are part of the Coca-Cola group, which all scored the maximum points for this topic.

Last part of the disclosure is related to the *Responses* of the companies, which is measured by 8 parameters, divided as follows:

- *Policies, governance and targets* are measured by 4 parameters, which are "Water statement/policies", "Quantitative targets", "Target water use" and "Target wastewater";
- *Internal actions* are measured by 2 parameters: "Measure water use" and "Continuous improvement";
- *External engagement* is measured by "Consult stakeholders" and "Engage the supply chain".

While the maximum score available is 16, Figure 4.12 shows the distribution of the companies of the sample between different intervals.

Figure 4.12 "Responses" value



Source: personal elaboration of data

The 31% of the population of the sample got a score between 3 and 5, which is the most populous interval of values. It is followed by the 27% of the companies which totalised an overall that is between 6 and 7, the 20.1% which is between 8 and 10, the 9.4% which is

above 13, the 7.3% which has 11 or 12 and, lastly, there is the 5.2% of the population which is below or equal to 2. The mean in the whole sample, in this area, is 7.1, which comes from the 6.3 as mean of the Energy sector and the 8.3 which is referred to the Food and Beverage industry. First element of this part is "Policies, governance and targets", which has a mean of 3.34 out of a total available score of 8. Even from this general data it could be said that the disclosure regarding this part could not be defined as sufficient. Data are very negative specially in the Energy sector where the mean is even lower (2.68) while the Food and Beverage's one is 4.3. Only 2 companies for each industry were able to get the maximum points, while the 20.8% totalised a score which is 0 or 1. Interesting is that all of these firms for which a so negative evidence was found are part of the Energy sector. As regards internal actions, the average of the score is 2.64, which could be considered a good result since the maximum available would be 4. In particular results are positive in the Food and Beverage sector where more than the half of the population scored 3 or 4 points. Moreover, in that industry none of the firms scored 0 and just 2 got 1 point. As regards the Energy sector, results are twofold: on one side there is the 60% of the subsample of firms that scored 3 or 4 point, on the other side there are more firms that got a negative score (16% of the companies totalised a value of 0 or 1). Last element is external engagement, which is the area with the worst score with a value of the mean equal to 1.11 out of a maximum value of 4. No significant difference was found dividing the sample into the two different industries, with average scores that are very close. In the Energy sector the percentage of firms that have a total value which is 0 and 1 is the 71.43%, in the Food and Beverage one it is the 75%. Just 3 firms in the whole sample were able to totalise the maximum amount. Said so, this result was predictable since it is composed by 2 of the lowest parameters of the water disclosure index.

4.4 DISCUSSION OF RESULTS

The goal of the analysis was to look at how two different sector which highly depend on water disclose water information and in particular to spot if in those information there could be find evidences in line with Sustainable Development Goal 6's objectives. Objectives 6.1 and 6.2 are more related with the right to water and sanitation and regarding those companies do not have much space for improvements. Instead, as regards the others, companies could do their part toward the common goal. Since the two industries taken into account are water intensive they are both concerned with a sustainable availability of water in the long run, so it is expected to find the same attitudes and objectives in the disclosure of companies that were agreed by the United Nations when establishing Sustainable Development Goals and, specifically for this analysis, SDG 6.

Objective 6.3 regards the improvement of the quality of the water through the reduction of untreated wastewater that is discharged and the promotion of water recycling and reuse. Related to this are many of the parameters chosen for this analysis. As regards wastewater, firms of the sample usually tend to disclose information regarding the quality more than regarding the volume in the case of the Food and Beverage sector, while it is the opposite in the case of the Energy industry. But while in the second case the value of the mean for both quantitative and qualitative information is above 1, in the first case both are significantly lower than 1. Information on the quality of wastewater was found to be detailed for different types of pathogens in the 38% of the companies of the sample, while it is completely absent in the 40% of the cases. In particular the Food and Beverage sector present lower evidences of this topic in their disclosure. The volume of wastewater, instead, present a peculiar element in both the cases: or it is not addressed at all or it is detailed by facility or geographical area or location of discharge. As regards water recycling evidences were quite negative in both sectors, but in the case of Food and Beverage industry the treatment of the topic was very insufficient. So, summing up, as regards objective 6.3 the two industries selected do not provide much information, in particular as regards water recycling practices which seems to be one of most important topics that could have an impact in future evolution of the water dependency of the sectors. In order to contribute to this objective also the communication of information regarding wastewater should be improved.

Objective 6.4 touches companies as regards their performance, since the objective aims at an increase in the efficiency of water uses in order to face the problem of water scarcity. Regarding the parameters used in this analysis the ones that seems to be involved in this issue are alle the ones that regards the goals and targets, the one regarding regional or a facility based reporting and the ones of the performance itself. As regards water goals and targets, as said before, there was found evidence in most of the reports, even if many times targets were specified only qualitatively on not in quantitative terms. In particular, the Food and Beverage industry present a better level of disclosure in this field. As regards the performance area, the two sectors present two different scenarios: on one side the Energy sector present a higher value of the mean and at the same time a higher percentage of firms that scored a very negative result, on the other side the mean of the Food and Beverage sector is lower but there are much less evidence of very negative scores. Lastly, regarding regional or facility based disclosure both the sectors present very good results, with that parameter that is consistently one of the highest in both industries. So, as concern this objective, evidences are positive as regards the communication of information regarding the performance and the deep analysis conducted not at a company level but at different geographical scenarios. This is particularly

important for the companies operating also in water-stressed areas since a measurement conducted in this way could highlight if there is an issue in some of them and put the accent of the improvement, especially in those areas. Instead, companies should improve their attitude toward targets: if they only commit themselves to improve their performance but without setting objective in quantitative terms the lose the possibility to be highly motivated in this path. Without a clear target in mind companies could face the risk to be happy even with a little sign of improvement while with a clear target in mind the could be more motivated to find new opportunities that could enable them to be more efficient. Since both of the sectors are water-intensive, an efficient use of water cold not only increase the sustainability image of the company but could also be translated in higher profits.

Objective 6.5 evokes an integration of water resources management practices in all the fields that have an impact on that natural resource. Companies, and especially those belonging to industries that highly rely on water, should incorporate this objective inside their attitudes and policies. This objective is related also to the 6.B one, which promote an attitude of collaboration with local communities as regards the management of the natural resources. Those goals are measured by many of the parameters used for the analysis: in particular, they are the ones belonging to the areas "External engagement", "External impact" and "Policies, governance and targets". These three areas are the ones for which the worst results were found. External engagement was fond to be almost ignored in both of the sectors, in particular as regard the engagement of the members of the supply chain, while at least partially there were evidences for the involvement of the stakeholders. Regarding external impact, results are slightly better but could not considered as sufficient. In particular the Energy sector present very bad results with strategic partnership that are always not addressed at all. In the Food and Beverage industry results are slightly better, especially thanks to the companies which belong to the Coca-Cola group, which in most of the cases disclose information also regarding this topic. Lastly, for policies, governance and targets results are not better than for the other two categories already mentioned. The Energy sector present the worst evidences, with a not irrelevant percentage of firms that scores a total value which is even lower than ¼ of the maximum available. Evidences in the Food and Beverage sector are better, with companies that are most likely to disclose information regarding targets regarding their use of waster and their wastewater treatment and at the same time policies which are not only specified in general terms but are also detailed for different operations in different geographical areas. To sum up, the disclosure regarding this objective could be defined as very insufficient, even if it is one of the most important element. For this reason, these bad results should be a warning for the companies itself not only to improve their image externally but also because a

common approach to the issue is the best way to find solutions that could bring advantages to all. Since the importance of the scarcity problem of water it should be interest of all to promote an attitude of collaboration in order to find a better way to manage the resource, in particular in the case of companies that need it in order to do their daily operations.

Last objective of Sustainable Development Goal 6 which could also be related to the disclosure made by companies is 6.6, which entails the protection of water ecosystems. This is analysed in the parameters used by those which belong to the are business risks and at the same it is related to a disclosure made at a geographical or facility level. For this second element, as previously said for the other objective, evidences are good in both of the sectors, while for the first one results are less unanimously positive. The Food and Beverage sector, in particular, present many companies with vary bad evidences which are balanced by the very good performance of other firms of the sample (in particular those part of the Coca-Cola group). In the Energy sector, results are much more stable near the mean value , which is higher than the one of the other industry. To sum up, in particular the Food and Beverage sector must be concerned by improving this area of disclosure because the fact that many of the companies do not disclose information regarding the water risks is a very negative outcome.

4.5 CONCLUSIONS

As stated by the United Nations in 2002, “Water is a limited natural resource and a public good fundamental for life and health. The human right to water is indispensable for leading a life in human dignity. It is a prerequisite for the realization of other human rights”. Companies are the second source of use of water, after the consumption made by people for drinking and households necessities, so should be assumed that they are also committed to an efficient use of the resource. The problem of water scarcity is both caused by a lack of supply and an increase of demand. OECD (2012) projected that by 2050 the increase in water demand will be of more than the 50% and recent climate changes even exacerbate this problem. In 2015, the United Nations agreed on 17 Sustainable Development Goals, and one of them (the sixth one) is entirely devoted to the water issue.

At the same time, as reported by Elfeky (2017), in this historical period for companies it is not enough to meet only the legal requirements regarding their disclosure but there is a general need for more information. The financial scandals that took place in the 21st century made financial information not satisfactory for potential investors in order to take their decisions. For this reason, companies started to disclose new information regarding also non-financial topics. This kind of information was called voluntary disclosure since companies disclose it

not to meet requirement but to it spontaneously. Water disclosure is one of the possible forms of this phenomenon. Due to this voluntary nature of the topic there is not a common path that should be respected when disclosing this type of data and each company can do it in the way in which the management want to do it. However, there are few organizations that are promoting a general set of guidelines that could be followed in order to arrive to a common form of this disclosure. Regarding water, two examples of organizations that published these forms of guidelines are the CEO Water Mandate that in 2014 published the document called "Corporate water disclosure guidelines" and there is the Global Reporting Initiative (GRI) which produced and update several version of guidelines arriving now to the set called "GRI Standards".

The aim of the analysis was to understand how two water-intensive sectors organised their disclosure regarding the topic and in particular to find if the objectives of Sustainable Development Goal 6 were incorporated or are undressed by the firms. To do so, an index regarding water disclosure was built through the content analysis of the reports published by the companies belonging to the Energy and the Food and Beverage sectors in the GRI Sustainability Disclosure Database. Results show that the two industries follow a similar path for most of the area analysed but regarding some topics address water issues in different ways. The area which shows the worst result is the one related to external impact and engagement. Both industries, even with different degrees, present a lack of this type of information, sign that there is not a common approach toward water issues in both the sectors. In particular, while the engagement of stakeholders is mentioned even if most of the times just to assess the materiality of the water issues in their opinion there is a general lack of involvement of the supply chain and the creation of strategic partnerships. This element will cause a slowdown toward the goals, since the best way to face the issue is developing a common attitude. As regards performance it was found that most of the companies of both the sector measure and report their water freshwater use, while less information are published regarding wastewater quality and volume, in particular in the Food and Beverage industry. In both sectors there is a lack of information regarding water recycling and reuse, element that could lead to an important step forward in the evolution of the water use of both the sectors analysed. As regards the assessment of risks both should improve their disclosure, but in particular Food and Beverage. Last evidence found was a lack of quantitative targets related to water issues in both the sectors.

As regards the presence of SDG 6's objectives in the reports of the companies, it was found that Objective 6.3 regarding the quality of water should be better address through an increase of data regarding wastewater quality and quantity (especially in the Food and Beverage

industry). As regards the increase in efficiency promoted by objective 6.4 both the industries should improve setting quantitative targets in order track their improvements, but there is the positive evidence that most of the companies measure and report their performance. Objectives 6.5 and 6.B are the ones related with external parties collaboration, and as said, this elements are treated very insufficiently in the reports, so should the area with the most needed improvement. Lastly, objective 6.6 is related to the protection of the water ecosystems and the risks assessment of companies: in this field while in the Energy sector, even if with different degrees, most of the companies treat he topic, in the Food and Beverage industry there are few companies with a detailed and complete disclosure while there are many others that do not addressed it at all.

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