‘Good GMOs’

The Norwegian endeavor towards the ‘good economy’

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Abstract

The following thesis analyses 50 policy letters disclosed by the Norwegian Biotechnology Advisory Board that portrait diverse visions from the public on deregulating GMOs in Norway. I assess these documents by interpreting them within the premises of RRI and study how Norway is changing its regulatory frameworks towards the realization of the 'good economy' (Asdal, et al., 2015). The analysis of this material shows that the realization of the 'good economy' is being built by transforming regulations on the basis of a change of positions from a precautionary approach to anticipation, and towards including public views in advance. Meaning that Norwegian authorities are being proactive and capable in taking into consideration different public concerns and diverse visions of the common good. Nevertheless, the capacity for responding effectively towards potential risks and benefits of new technologies will depend on the guiding parameters of specific terms, and if new technologies are regulated by equal criteria than the used for other substituting technologies.

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List of abbreviations

ANT	Actor Network Theory
AurOmega	Microbial production of Omega-3 fatty acids
CUDOS	Communism, Universalism, Disinterestedness, and Organized Scepticism
DLN	Centre for Digital Life Norway
ELSA	Ethical, Legal and Social Aspects of science and technology
EPA and DHA	Essential fatty acids Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA)
GMOs	Genetic Modiefied Organisms
IPCC	Intergovernmental Panel on Climate Change
MIRA	Microbially produced Raw materials for Aquafeed
ReDig	Responsibility as an Integral Component of Digital Research Practices in Bio-and Nanotechnology
RRI	Responsible Reseach and Innovation

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1 Introduction

In the following thesis I interpret the notion of responsible research and innovation (RRI) from empirical material portraying an attempt to deregulate genetic modified organisms (GMOs) in Norway. I do this in an effort to understand how Norwegian regulatory frameworks are being transformed towards the realization of the 'good economy', namely the aim of visualizing a new economy founded on the use of new technologies and ethical features (Asdal et al., 2019). Accordingly, my aim is to study the Norwegian effort for approaching the 'good economy' by focusing on public ethical and technical valuations rather than solely economic. This focus on the 'good economy' is thought to set the study within a specific sociopolitical context, and also serve as a guideline for the theoretical and methodological approach I use along the analysis.

1.1 Context and purpose

The Norwegian Biotechnology Advisory Board aims to deregulate the current law for GMOs. This a bold move given that Norway is one of the most restrictive GMO countries in the world. If GMOs are deregulated, there will be an explosive increase of GMO research and innovation. Consequently, critical issues about public opinion on GMOs will have to be considered if Norway aims to follow the premises of the 'good economy' in a technical and ethical way.

This thesis aims to be a contribution to the project named Res Publica that operates within the Centre for Digital Life Norway (DLN). The objective of Res Publica is to do transversal research on projects within DLN in order to know how software-based biotechnology can be developed responsibly. Accordingly, Res Publica is underpinned by the principles and practices of Responsible Research and Innovation (RRI). The focus on RRI is important because the Research Council of Norway has given DLN the mandate to be a 'lighthouse' for the creation of economic, societal and environmental value from biotechnological research and innovation.

Several research projects at DLN, such as AurOmega and MIRA, are interested in a new generation of GMOs which can edit new organisms without leaving any trace of manipulation. This is important because GMOs may help revolutionize the production of essential nutrients, and become a crucial technology in the Norwegian endeavor towards the 'good economy'. Accordingly, the strive for accepting 'good GMOs' as part of the Norwegian 'good economy' is a process that needs to be carefully analyzed by considering key ethical and technical aspects.

1.2 Questions and structure

The primary research question that serves as a basis for conducting the thesis is the following:

> *How are current regulatory frameworks in Norway being transformed towards realizing the 'good economy'?*

My answer to this question is formed by analyzing two policy initiatives. First, I have chosen a specific regulatory framework that is set to achieve a transformation towards the good economy. This refers to the analysis I do on the Norwegian governmental aim to deregulate GMOs. Second, I focus on RRI given that it is a preventive policy measure directed to create a new relation of science with social, economic and political values in the midst of the 'good economy. This way of setting the study is thought so that I can relate these two policies in a feasible way.

The strategy I use for relating these two policy initiatives is based on analyzing the public concerns and the diverse visions of the common good in the material gathered by the Norwegian Biotechnology Advisory Board in the 2018 consultation process aimed for deregulating GMOs. This is feasible because the Res Public Project addresses RRI by considering the same terms. The literal meaning of the word *'res publica'* in Latin is *'common good and public concerns'*. While the material disclosed by the Board portraits the public concerns that diverse Norwegian actors have about potential risks and benefits on the common good when deregulating GMOs. Meaning that both policy initiatives can be related and analyzed in a direct and realistic way. This is interesting as both policy initiatives were promoted by actors with no relation what so ever, and to my knowledge there has been no other study in which such relation has been tried.

It is by considering this way of setting the study that I will first analyze all the public concerns and the diverse visions of the common good enacted in the documents disclosed by the Board. Then, I will discuss how RRI resonates within this material by applying the guiding practices defined by Stilgoe et al. (2013) and established by the Research Council of Norway. Hence, I will respond the main question of the study by asking the following two sub-questions:

1) *How are public concerns and diverse visions of the common good enacted in the documents disclosed by the Norwegian Biotechnology Advisory Board, and how do they inform about the changes proposed by the new GMO law?*

2) *How does responsible research and innovation (RRI) resonate with the addressed public concerns and diverse visions of the common good?*

These sub-questions are responded throughout the analysis done in chapters 5 and 6, respectively, and serve as a basis for responding the main question of the study in chapter 7. The methodology used for the analysis, described in chapter 4, is presented after discussing the theory in chapter 3. This is done because the methodology is conceived as an application of the parameters defined by the perspective of the 'good economy' which are presented in the theory. The background of the study is thought to present the political scenario that describes the significance of the proposed idea for changing the law about GMOs in Norway, and then shortly describes the two policy initiatives that I am to relate further in the analysis on this thesis.

The analysis of the material is done with the help of visual graphs that I present in chapter 5. These graphs are only a representation of how I have interpreted the material, they are not the result of a quantitative analysis, as this thesis is done by following a qualitative approach. Meaning that they are only a tool that helps me explain how I identify and group different documents while studying the valuations, and not a measurable designation of the documents. I present this graphs in chapter 5 (Valuations) and not in chapter 6 (Discussion) because it helps me and the reader understand the logic behind my analysis while identifying the valuations. For more information about the graphs please see the Appendix.

1.3 Motivation and concerns

This thesis is partially a result of a deep personal curiosity for understanding the topic about GMOs in Norway. This is because of my professional experience while working along with small-scale farmers in several developing countries in Latin America between 2005 and 2010. My on-field experience showed that the shift from organic and conventional production to the use of GMOs did not necessarily mean always higher mass productivity, but enabled me to use less toxics, reduce plowing and minimize hand weeding. This meant lowering costs for chemical use, gasoline and field work. Thus, at the end it implied having a higher income and the avoidance of soil disintegration, besides a clear reduction of carbon soil release and the reduction of chemical toxicity per area of production. Given this experience, I of course was not surprised when I saw that the adoption of GMOs among small and large scale farmers was fast and massive. The surprising moment came later when I arrived to Norway and became exposed to an entirely new vision on GMOs. My shock in Norway was even bigger when I noticed that not only lay people, but even several experts within diverse fields of biotechnology, were also skeptic to GMOs. The visions on sustainability, social utility and ethics on GMOs in

Norway were totally different from what my experience had shown. It was within this context that I began to wonder how is that Norwegians understood the notion of responsibility. How much did different actors of the Norwegian society really know about GMOs and their real effects? What were their priorities and interests? What did research institutions or farmer associations in Norway say about this? This personal curiosity led me to find an opportunity to analyze and find a response to some of these questions while working with this study.

This thesis is also an effort to address the call that several researchers have done about the need to conduct a practical case analysis about RRI on one hand and the 'good economy' on the other. Accordingly, this study is the result of the effort for finding a relevant case in Norway that could help understand the difficulties and benefits of how RRI is being applied in practice. Furthermore, this study is also the result of finding a practical case in which it would be possible to analyze how Norway is enduring its transformation towards the 'good economy'. Besides being an interesting and creative combination, I decided to focus the study in this way because I aim to research the 'good economy' by taking into consideration ethical and technical concerns rather than only economic. As a result, this project can also be seen as a contribution to the work done at the Little Tools Project based at TIK-UiO.

The idea of having a study about RRI and the regulation of GMOs in the context of the Res Publica Project arouse as a consequence of internal discussion at the Centre for Digital Live Norway (DLN). In February 2018, a workshop was organized by the AurOmega and MIRA projects under the title: "Genetic modified organisms – friend or foe in sustainable growth?" The workshop raised many key questions about the use of genetic engineering, and concluded by naming the importance of being open about the possibilities of using GMOs at DLN. Accordingly, a study addressing key troubling issues about RRI and the need of using GMOs within the context of the new 'good economy', was set to be a clear contribution to Res Publica.

Finally, the case of deregulation of GMOs in Norway is highly important to address because of the significance of the change that is currently happening. From being a country internationally recognized as one of the most highly restrictive with GMOs in the world, it is now becoming a country with a new open GMO policy along a high encouragement for innovation on the field. This is significant because it reflects the transformational effect that the vision of 'good economy' is having as a sociopolitical model in all levels and spaces of the Norwegian society. This topic is discussed on more detail on the next chapter as an introduction to the background.

2 Background

The following chapter is thought to provide the contextual description needed for understanding the analysis done along the thesis. It begins by explaining the basics of genetic engineering and the historical and sociopolitical significance of the possible change of the law for GMOs in Norway. Thereafter, it presents the two policy initiatives over which I will base my analysis.

2.1 Genetic engineering in Norway

Genetic modified organisms or GMOs are defined in Norway as "microorganisms, plants and animals whose genetic material is changed with the use of genetic engineering" (art. 8, Genteknologiloven, 1993). Meaning that GMOs are living beings that have had their genetic code altered in a specific way. More specifically, they are the result of a technique within genetic engineering in which only a target part of the DNA has been manipulated by scientists. This means that in contrast to other techniques, the change that GMOs endure is minimum as most of the DNA stays unattached. This is important to understand as there is a tendency among the public to believe that GMOs are a radically altered organism. Actually, most techniques that change genes and have been used for decades (and are considered as safe), change not only more genes than what is changed in a GMO, but do it much more randomly (WHO 2014).

Norway is internationally known as one of the most restrictive countries in the world for GMOs. This is not only because of the current law, but also due to how it engaged in restricting GMOs at the negotiations of the United Nations Cartagena Protocol on Biosafety in the early 2000s. Such initiative, which is an international agreement designed to ensure the safe handling, transportation and use of living modified organisms (another way to define GMOs), fallows today several of the premises that the Norwegian delegation encouraged during the process. Along with the European Union, the Norwegian government promoted internationally the idea that GMOs had to be assessed in the basis of the criteria defined by the Precautionary Principle. Meaning that the approval of GMOs could only be done after there was sufficient scientific evidence of no harm on society and/or nature by the production or use of this new technology. However, Norwegian policy reached further than the EU as it not only aimed to asses impacts on the environment and human health, but also on sustainability, social utility and ethics.

The main law regulating GMOs in Norway is called the "Norwegian Gene Technology Act". Its aim is to ensure that the production and use of GMOs is done in an ethical, sustainable and societally responsible manner, and without harmful effects on health and/or the environment. Until this date almost no organisms or products have been approved for the Norwegian market given that very few have been able to fulfill the requirements. This is mainly because there has been very little demand for GMOs from both Norwegian producer and consumers, but also because the procedures for approval are very extensive and costly, which is discouraging given that the Norwegian market is not big and does not offer any specific incentive (NBAB, 2018).

The modification of gens in plants and animals is a very old process that has been done by breeding techniques as a way to search for improved traits that could increase yield, resist disease and improve flavour. "Traits" is a term that refers to the characteristics defined in the DNA that gives a function to specific organisms. The specific selection of traits has existed for about 2500 years, and gene cross breeding techniques began in the 17th century. What is new with GMOs is that it enables scientists to do this same modification of genes with more precision. This gives the opportunity to have better control of impacts that one has with other techniques. It allows to easily analyse genes and their function so that it is possible to erase specific traits of organisms and avoid the formation of unwanted or dangerous traits. It also gives the opportunity to create new traits which would have been difficult or impossible to do by other methods as for example by using synthetic biology (Dubock 2017a).

These new characteristics of the technology are highly relevant for many actors in Norway who are engaged in creating or producing products in new ways. This emphasis on innovation is an effort of the Norwegian government for creating a new economy not depend on fossil resources. This new economy, termed as the 'bioeconomy', is a model aiming to maintain sustainable economic growth within our planetary limits. In other words, it is a search for maintaining the development patterns that past generations have set before us, and doing something about the conflicts we have inherited (Asdal et al., 2019). The potential benefits that biotechnology, and especially GMOs, are known to provide are key in achieving this new economic system. It is widely shown that GMOs can have significant benefits for key sectors in Norway such as in the fish industry, agriculture and the production of drugs (Dubock 2017a).

One of the most significant examples is the impact of GMOs on food production in Norway. Norwegian farmers use 65 million kroner for the use of chemicals to tackle just one of many diseases, Tørråta, which affects potatoes (Ness 2018). With the use of conventional techniques, it is possible to create potatoes that are able to tackle this sickness by using conventional procedures, but it takes many years of experimentation. This is because it is difficult to create a product that is able to resist the disease, grows in different areas, is big enough for consumers along good colour and flavour, etc. GM Potato is a direct solution to the problem as it has shown to cut the use of chemicals up to 80% (Kessel et al., 2018). Nowadays farmers in Norway must use chemicals every fourth day in the worst seasons to combat the disease, meaning that in just one season Norwegian farmers spray between 6 to 8 times one crop (Mellemstrand, 2018).

The interest that researchers studying digital biology at DLN have of GMOs is due to the fact that this is a technology seen as crucial in the creation of essential nutrients for healthy foods. The projects AurOmega (Microbial production of Omega-3 fatty acids) and MIRA (Microbially produced Raw materials for Aquafeed) are both investigating the potential of microbial production of omega 3 fatty acids for fish feed. Researchers at both projects think that GMOs could help produce unsaturated fatty acids such as EPA and DHA, which can prevent and have positive effect on a variety of conditions and illnesses, including rheumatism, diabetes 2 and cancer. EPA and DHA are the most useful types of omega-3 fats and are found in fatty fish and algae. Today's production of EPA and DHA only covers 34 percent of the worlds need, thus there is a great commercial incentive for increasing production. Besides reducing cost, GMOs could also help improve the formation of synthesis pathways and reduce the degradation of important components needed for producing EPA and DHA (Onsager, 2018).

2.2 Deregulating GMOs in Norway

The establishment of the first Norwegian law on GMOs (Genteknologiloven) in 1993 was seen by Norwegians as a matter for proudness and a way to mark national values praised by the state. This is one of the reasons for which it has stayed untouched for almost three decades. Nevertheless, the recent call for a change in the law was not unexpected as most countries in Europe are reformulating and redefining how to re-regulate their current laws on GMOs. Sweden, for example, is in general reluctant to GMOs, but it has approved the production of a GMO potato, and has decided to regulate CRISPR gene-editing organisms as non-GMOs.

The first draft proposed for a new law was done in December 2017 by the Norwegian Biotechnology Advisory Board and was used to open a national dialogue on regulating GMOs. The initiative for proposing a new law came from a unified call from the members of the Board. Besides the fact that there are new technological advancements, the call for reconsidering the law was done because it is considered to be too time consuming and costly for all applicants. Besides, reformulating the law is important regarding the Norwegian's government initiative for creating the right conditions needed for empowering the future bioeconomy.

The final proposal written by the Board is a midway political and technical solution between the push of actors aiming for deregulating GMOs and those hoping to maintain the current system. The main idea of the proposal is to have a level-based model that can reduce time and cost of development and approval of GMOs, while also enable authorities have a sufficient general overview of what is being introduced and produced, and what not. This is important so that the government may be able to intervene in the event that a problem of any kind would arise with the importation, use or production of a GMO in Norway. It would also allow authorities incentive research or production of specific GMOs in case there is an identified need.

It is with this is mind that the Board proposed two models to be discussed and voted among. In the first model, the levels are determined on the basis of the type and extent of a genetic change that the organism has experienced. The purpose is to adjust the risk assessment and reflect on the possible risk done by the introduction of a new gene. This would simplify and facilitating the approval process, and follow a case-by-case assessment with the possibility to upgrade the risk level in case it is necessary. The assessments of health and environmental risks, sustainability, societal benefit and ethics are thought to be performed in parallel manner.

In the second model, which is under the name of 'public morals', the levels are defined by a moral and ethical assessment, which includes assessing sustainability and societal benefit. The purpose of this model is to focus on the benefits of GMOs, and simplify the approval process by avoiding wasting resources on risk assessments of products that are likely to be rejected because of moral grounds. This is based on a previous experience in which Norwegian authorities refused to accept a sort of maize because of ethical implications after it had been approved by a scientific committee after evaluating potential environmental and health impacts. As with the other model, the evaluation is thought to be done in case-by-case basis and with the possibility to readjust the category of assessment depending on the possibility of moral risk.

2.3 Responsible Research & Innovation (RRI) in Norway

The notion of RRI is the result of changing dynamics between science and society over history. Starting at the objective search for truth from the 17th century, passing through the so-called CUDOS principles, codes of research integrity and research ethics, and finalizing on the entrepreneurial researcher who questions the need to follow market-knowledge based pressures. Today's RRI undertakes a critique of evidence and risk-based regulation as an approach to governance, and it is based on arguing that responsibility should center on the ethical, cultural and political entanglements of science, and not only on the economic viability of products in relation to their environment, health and safety risks (Morsman 2017). It seeks for a model based on care and responsiveness, and thus change the assumed natural role of responsibilities among researchers as a way to inculcate a more integrated perspective (Stilgoe et al., 2013).

Responsibility as a word did not appear in the western vocabulary but until the 18th century, but its conceptualization in relation to research can be traced to the beginning of science. One of the first written accounts about scholars addressing the need to be responsible with research and doing something about it, comes from an anecdote staged in the 16th century. In 1531 the Italian mathematician Nicola Tartaglia wrote an equation for defining the behavior of a cannonball in relation to its weight, but decided to burn his findings as he realized that they would only contribute to thrive local wars affecting normal citizens the most (Rip 2014). Important to note in this tale is that the notion of responsibility relies exclusively on the scholar and on the potential impacts of his research. There is an underlining idea that it is only the research community who can define possible risks and benefits of a new technology. This perception has changed over time, as the notion of responsibility has become much broader.

Today's understanding of RRI encompasses not only scientists, but all actors involved within research and innovation, such as in financing, regulating, making, criticizing, using, commercializing, and even taking into account non-users of a technology (Rip, 2014). Consequently, this modern perception of responsibility takes special attention on the public's engagement on the development and use of scientific knowledge (Morsman 2017). Addressing the public's opinon is based on contemplating their concerns and respecting their diverse visions on the common good. This is why RRI can be interpreted differently along different countries, as it also depends on the social contextual features that make such society.

Sarewitz (2004) states that societal support for science is forged by the expectation that science is to benefit society through financial means, either by contributing to technological innovations or by providing informing decisions. The idea of the social utility of science can be traced back to Vannevar Bush's influential 1945 essay on *Science—The Endless Frontier*, which argued that science was the pre-condition for societal improvement (Bush, 1945). Although important to acknowledge the authority of science, this position led the basis for the formation of the 'lineal model', which states that the best decisions for governance depend on the quality of scientific knowledge (Beck 2011). Researchers within STS argue that both, the lineal model and the deficit model, are empirically wrong and dangerous given that they tend to reduce complex issues to nothing more than a discussion about scientific facts. The underling idea is that the relation between policy and science is reliant on each other, and dependent to external sociotechnical variables that are based on other type of knowledge (Neff et al., 2017). Besides, producing more science does not necessarily lead to better outcomes. In some cases it can amplify economic inequalities, contribute to environmental challenges, or exacerbate policy controversies (Woodhouse y Sarewitz 2007).

Sundqvist et al. (2015) explain that what needs to be done is to study what other possibilities exist and try to understand how they could be constructed, along with what type of consequences they have and define positive alternatives. This is the type of model to which RRI tries to respond and over which the notion of responsibility is built. RRI starts from an approach in which it is important to understand all type of knowledge within their own premises, which means taking public concerns seriously (Wynne 2007). This special sensitivity over the public's views is important as science and technology are transformative as long as they are recognized as entangled with political, social and ethical issues. It is only by recognizing this complexity that the real change can be achieved. Science and society need to be seen as two faces of the same coin that have different features, but are integrated as one (Lidskog and Sundqvist 2015). The four guiding practices of RRI are built over this principle and reflect this complexity.

Following Stilgoe et al. (2013) RRI is formed by the interaction of the following four guiding practices: anticipatory, reflexive, inclusive and responsive. *Anticipation* refers to possible and plausible scenarios about how results might be used, what might go wrong, and reflections on which unexpected events may occur. It is not to be understood as prediction nor a promise. *Reflexivity*, as explained by Stilgoe et al. (2013), "is like holding a mirror up to one's own activities, commitments and assumptions, being aware of the limits of knowledge, and being

mindful that a particular framing of an issue may not be universally held". *Inclusion* is set in RRI as a sense of creating arenas for discussion with diverse actors and securing transparency. *Responsiveness* is seen as the capacity of scientific research to be flexible and capable to provide real solutions to real problems both on short and long term perspectives.

The European Commission (2012) states "RRI means that societal actors work together during the whole research and innovation process in order to better align both the process and its outcomes, with the values, needs and expectations of European society." It also takes into account public engagement, gender equality, science education, open access, ethics and governance. The Norwegian framework for RRI is similar regarding these six points. It completely overlaps with public engagement and ethics, but does not directly mention gender given that it is already part of the research council's requirements in funding applications. It is in this sense that RRI is a preventive research policy measure, not a legislative framework, developed within the European Union and well regarded in Norway (Morsman 2017).

What is interesting about the development of RRI, is this especial focus on being preventive (Guston 2014). Based on the previously addressed story of denoting responsibility along scientific research, one can notice that there has been a development towards a more proactive role using science to define future effects (Rip, 2014). From a stage of defining the relation between science and responsibility within a precaution approach, to a more preventive one. This can be clearly noticed when Stilgoe et al. (2013) denoting RRI as being anticipatory. The final goal with being anticipatory is to not only define mitigation strategies for possible risks on the use of technology. It is also about achieving a new type of governance that can motivate activities designed to build subsidiary capacities in foresight, engagement, and integration (Barben et al., 2008). As seen in the framework for BIOTEK 2021, the major meta-project for biotechnological development in Norway, anticipation ('fremadskuende') is described as a new way to address what before was defined by precaution for future effects and benefits of new technologies. This specific feature is relevant for the coming analysis of this thesis, given that the GMO case seems to have followed the same development towards being more anticipatory.

3 Theory

The theoretical approach of this study is based on understanding that responsibility is a valuation practice being enacted in the precincts of what is known as the 'good economy'. Accordingly, the following chapter will begin by presenting the two bodies of literature from which the 'good economy' is conceived as addressed by Asdal et al. (2019). Thus, the term 'good economy' is used here not only in reference to a new economic system as previously explained, but also as an analytical concept that provides a specific literature focus.

3.1 Valuation studies and the bioeconomy

Valuation studies developed from actor network theory as a way to reframe the market through an approach focused on the practices that create the economy (Muniesa, Millo, and Callon 2007). This represents a step forward from the classical viewpoint of Actor Network Theory (ANT). This is because the initial idea behind ANT was that science should not be explained or described by an external logic or force, and social elements should not be privileged on the expenses of nature. However, in recent years the main logic of ANT about the mutual production of the natural and the social evolved into the understanding of how things become part of the market, which is precisely what valuations studies is all about. Meaning that ANT and valuation studies treat agency in a similar manner, with the difference that the latter is takes a step further in an effort to understand how value is forged or how things become economic. A consequence aligned with what Chiapello (2014) explains as a development in which the financial way of thinking is conquering over new areas of knowledge.

The underling idea of valuation studies is that nothing is economic per se, but everything may in principle be made economic according to the relations in which they become entangled in society and science. In other words, the economy is an achievement made in action rather than a preexisting reality (Çalışkan and Callon 2009). Thus the focus is not on the economy as such, but on the economic practices and devices that create that economy, the so called markets in the making. The term 'valuations' is key because it focuses on valuating practices instead of on the 'value' as in financial terms or 'values' as in social terms. This specific emphasis on the word valuations talks directly to the practices performed while valuing, and thus enables to understand the actions behind the creation of worth (Muniesa 2011). The advantage of focusing

on practices is that it helps to understand the hiding elements explaining the rationality of why certain modes of valuating take place in an economy while others do not (Fourcade 2011).

An important element of the notion of valuations addressed originally by Dewey (1989), who is seen as the father of valuation studies, is that it enables to move across academic disciplines such as from economics to sociology. This implies in other words that it allows to connect elements between economics' value and people's value on objects that can become economical. This relation is what has led valuation studies venture towards analyzing social practices related to concrete objects easy to identify and introduce into the market. Consequently, literature about valuation studies has tended to immerse in the materiality of the markets, financial markets and abstract commodities, building a sort of insensibility towards unmaterialistic issues (Boltanski y Chiapello 2005). As a consequence, elements that are not recognized by the materiality within markets, such as environmental services or the value of life, are largely missing within this body of literature. This is what is known as the 'bio critic' of valuation studies: the lack of including unmaterialistic valuation practices that account for the invisible actions of considering life.

Although important efforts and even successful ones have been done to incorporate unmaterialistic elements into the market, they have usually been isolated cases. Few example are environmental services such as the carbon market, biodiversity assessments, and natural amusement valuations (Boltanski and Chiapello, 2018). Actually, one could easily argue that many of today's grand challenges such as climate change, dysfunctional waste systems or soil over exploitation, are partly a consequence of such problem. Today's financial markets are incapable to provide a real value to valuable environmental services (Boltanski and Chiapello, 2018). Within political science, one of the most important efforts to confront this issue has been the introduction of the term 'bioeconomy'. The 'bioeconomy' is a national and global effort for building a new economy reliant on the creation of products constrained within a new sustainable model centered on revaluing life. As explained in the background chapter, the bioeconomy is a concept that is based on promoting a socio-environmental sustainable system of production.

The essential idea behind the bioeconomy that is relevant for valuation studies is that it integrates the notion of 'life' as capital by making it into a productive and transformative force. It is the result of conceptualizing life as an entangled element within the economic system, turning the essence of nature into a type of driving economic force (Yoxen, 1981). In today's United States, the bioeconomy is seen as a system based on the conversion of raw materials into products, mainly within projects of life sciences (OECD 2009). While in the EU it is about

how biomass can be used as a resource that can enable the transition into a circular low carbon economy (European Commission, 2012). However, literature dealing with issues about the bioeconomy lack an analytical apparatus that can deal with issues of value. There is very little focus on valuation practices that make the bioeconomy. Therefore, Asdal et al. (2019) explain that it is here where valuations studies can give a hand to the current framing of the bioeconomy.

By integrating these two bodies of literature, valuations studies and studies about the bioeconomy, one may address the 'bio critic' on one hand while also provide a new understanding of the bioeconomy on the other (Asdal, 2018). Besides, it complements valuation studies with a perspective to consider the political influences that are under play when studying practices of valuation. Interestingly, the integration of these two bodies of literature has an additional effect. It modifies the meaning of the term bioeconomy to not only refer to the policies and national strategies that integrate life into the economy, but also refer to the conflation of capitalistic speculations normally treated only within pure economy. Meaning that by considering the bio critic, the term bioeconomy becomes a term not only referring to the formation of a new macro-economic political system, but it also becomes a term acknowledging how biological objects become entangled within economic projects (Asdal et al., 2019). Nevertheless, this double meaning of the bioeconomy is simply a visualization helpful to understand what the bioeconomy is. The envisioning of the bioeconomy done by Chiapello (2014) or Fourcade (2011) show that these two meanings of the bioeconomy are simply two different visual angles of the same thing. Meaning that they are not really two separated objects of study, but different interpretations of the same thing: the economic system of our future.

Asdal et al. (2019) state that this integration between undertaking the bio and valuations studies can be done by focusing on the concept of the 'good economy'. Not referring to an economy that is "more good" than classical conceptions of the economy, but as an economy in which the good is the main point of confrontation. An understanding of the economy that is willing to be open about discussing what is good, and does not come with a determined version of the good. In concrete this interaction can help better understand economic relations, policy-economy relations, and life science-policy-economy relations as explained by Asdal (2018). Even more important, these relation may help analyze the practices that create or frame value, the valuations within the bioeconomy. For if such analysis is to be done, it is important to understand that practices of valuation are not only about economization, financing or

commodification, but also about co-modification between elements linking society and the technicalities defining reality. In this sense, valuations can also be ethical.

Valuations can be ethical practices creating value. This is not only because there is an intrinsic relation between the production of capital and ethical practices as addressed by Weber (1904) in his famous book 'The Protestant Ethic and the Spirit of Capitalism', but also because ethics is in itself a form of valuation (Gorski 2013). Meaning that the ethical valuations that different actors enact along society should also be taken into consideration when addressing practices that create value. Public concerns and diverse visions of the common good are different forms of ethical practices that need to be taken into consideration when understanding the formation of new socioeconomic systems, such as the bioeconomy. The consideration of ethical valuations turns especially critical if one is to have an approach based on the good economy.

For the case of this thesis, having a focus on the 'good economy' provides a unique perspective about the interaction between the two sides forming the discussion for re-regulating GMOs. On one hand, it helps to stage how GMOs form part of a national strategy for the creation of a new sustainable economy in which life is at the center of the technology, which directly reflects the classical terms of the bioeconomy. While on the other hand, it allows to stage how policy letters can be seen as valuation practices through which diverse publics enact their concerns and visions about deregulation of GMOs. The term policy letters refers to documents that express specific public concerns and the vision of the common good of an individual or an organized group of actors interests on a particular matter that is under discussion for future regulation. Consequently, such policy letters are in its essence an accumulation of valuation practices. Meaning that the case study used for conducting this thesis fits perfectly within the premises formed by the 'good economy'. One can see in a practical manner how valuation studies can be complemented with the classical perspectives of the bioeconomy.

3.2 Responsibility within the 'good economy'

Approaching the open public process for the re-regulation of GMOs by enhancing the concept of the 'good economy' emphasizes the fact that the documents sent to the Norwegian Biotechnology Advisory Board are enacting their aim to transform the Norwegian bioeconomy. The documents are making valuations about their concerns and what is to be understood as the common good on the basis of discussing a future law. They are not simply giving opinions,

they are part of an effort for making the terms over which the future society will be attended. In other words, they are establishing the premises of what Foucault defined as biopolitics (Adams 2017). This is critically important to consider because the making of the law can be seen as a moral technology that enacts and takes part in modifying the biopolitic collective.

However, Foucault's main focus is not on who is counted as a subject of law, but on the issue of life (Wolf 2013). He says that the main point of interest are the forces conflating around an identity, making it. In other words, what is interesting with the law is that it is an important site to study how life is being inserted into a context. Asdal et al. (2016, p.67) state that "the law is an understudied technology that works upon bodies and the biopolitical collective". Thus, the law can be approached as a site for working out different versions of ethical and social acceptability. Depending on how it is written and applied, it can define moral values, and the acceptance or not of new visions or contrasting translations of justice (Rose, 2001). At the end, the essential idea is that the law can create and re-create different versions of responsibility.

The main critical element under analysis should be how policy inputs define the issue of life. Meaning defining how determined policy inputs, such as the addressed policy letters, approach the issue defined under the terms of *'res publica'* (i.e. public concerns and the common good). The definitions, the type of prioritization, the concerns, prejudgments, etc., of the presentation of what is understood as public concerns and the common good. As explained before, these are a type of valuations being done in the context of the bioeconomy that can provide key information about how the good economy is being formed. The main point, which is the theoretical basis of this thesis, is that within this approach one can grasp the notion of responsibility by focusing on how public concerns and the common good are being articulated.

'Public concerns' within STS has usually tended to simple denote the public's involvement in expert-only issues of science and technology. It is largely an idea developed from the notion of public understanding of science addressed by Wynne (1995) as a way to measure public attitudes towards science and give science a central role in the operations of a democratic state. However, this perception has been criticized because although it provides the public with a place, it is still treated as a singular an undomesticated group without no real understanding of science (Wynne 2007). Thus, there has been a call within STS to respect, hear, understand and respond to the issues which ordinary publics develop as concerns arising from their experience on research and innovation. With the term public concerns and the common good, I try to make

this distinction and acknowledge the uncertainties, hopes, ideas, ideals and not least knowledge about socio and techno scientific issues of a largely diverse group of actors forming the public.

The notion of responsibility can be seen as a valuation practice, a practice that can be understood as a consequence of enforcing the good economy. An economy that creates a specific context for accountability in which there are tensions between defining what is right and what is wrong. In this sense, the notion of responsibility can be understood by how actors determinate their ideas on public concerns and the common good of a particular issue within the bioeconomy. This perspective develops from the fact that there is a need to understand the risks and uncertainties of the bioeconomy in a responsible way (Rip 2014). In other words, the notion of responsibility is born as a reaction of troubling the good economy, contesting it, analyzing it, investigating it and calling it into question.

This constraining of uncertainty provides an opportunity to understand responsibility as a result of enacted valuations formed by diverse actors representing the larger public. Lahn y Sundqvist (2017) state that the study of responsibility should be actor oriented and studied within the actions and practices that bound scientific and political arguments of society. This means to study what responsibility is in its concrete space, situation and real context, not only where it seems obvious or easy (Marres 2007). It needs to take into consideration the perspective of not only experts, but also other type of actors, shifting the classical positioning of science and aligning it with society. A change from what used to be the ethos of science to a new ethos of science-society relations integral to the bioeconomy (Asdal et al., 2019). Consequently, one needs to see deep in the elements that create uncertainty within the interrelation between science and society, and 'interpret' these perceptions into concrete ideas about responsibility.

Finally, defining responsibility as a valuation practice within the good economy denotes several important challenges that are important to consider. First one must reflect on the governance dimension of responsibility as it mirrors the fact that the attribution of responsibility is an act done by specific actors and affecting others. Second, one needs to take into account the moral dimension of responsibility, which is addressed by the question whether actions and decisions should be regarded responsible relative to a body of rules. Meaning that one needs to be clear over the bias and background of one self and of others when understanding what responsibility is. Finally, it is important to address the epistemic dimension, which refers to the quality of the knowledge about the subject of responsibility that is being addressed (Grunwald, 2011).

3.3 Relating RRI with the 'good economy'

The following subsection is an effort to explain how an analysis centered on the good economy can help me interpret the previous discussion on valuations to the four guiding practices of RRI. Meaning that the idea is to use valuations studies and studies about the bioeconomy as two bodies of literature to explain how RRI can be interpreted from the material used in this study. Accordingly, I will focus on the four guiding practices of RRI (anticipation, flexion, inclusion and responsiveness) and discuss how they can be analyzed by these two bodies of literature.

'Anticipation', as explained in the background chapter, is not to be understood as prediction nor a promise. It is an effort to envision future accounts of the actions being taken today. Within valuations studies this would be seen as an action done today that defines future values. This is important for determining future effects on the new models being defined in the new bioeconomy (Guston 2014). For instance, the interest on anticipation has developed in the context of climate change research. Antoine, et al. (2019) focus on anticipation to foster the formation of future climatic scenarios and the use of future technological solutions. This has shown to be important as an emerging field of expertise for prediction within literature about the bioeconomy. It is within these terms that anticipation can be seen as a result of defining how good the good economy can really be by the valuations being done now. A direct materialization of the notion of responsibility within the good economy. Meaning that if one is really going to make an effort for being responsible within science and technology in the premises of the 'good economy', anticipatory valuations must be addressed as a high priority.

'Reflexivity' is known as the effort for being conscious of the origin and impact of one's own actions. It is a valuation of self-recognition aiming to define the type of background, framework, use of concepts, models, etc., that an actor has within her or himself. Within STS this is known as 'situated objectivity', notably addressed by Haraway (1988). Reflexivity within the terms of literature about the bioeconomy has tended to come out as actors reflect on the different models they use for interpreting their version of the bioeconomy. As for instance Cooper (2008) reflections on the Reagan led version of the bioeconomy in the United States, in which she criticizes that the major problems thought to be resolved were just move in time and space. Thus, reflexivity within RRI must denote how the responsibility is to be accounted by its own means. It makes responsibility have to carry some sort of understanding of what and why an actor is doing one specific action and not another.

‘Inclusion’ within RRI is a search for taking into account all type of actors and visions in an open and transparent way. Valuations of different actors are to be taken in the highest consideration, independently if they come from experts or lay people. Within valuations studies this is a way to create value in itself given that the free and democratic expression of ideas creates trust within the public (Dewey 1989). Along literature of the bioeconomy, inclusion is also understood as democratization process, but instead of focusing on the creation of value, it centers on the formation of macro political process that take into consideration new groups in society. Combining these two approaches enables to understand how new and extended networks of actors are able to coup social sectors previously not considered (Wicken 2016). It is in this regard that inclusion is central as a pillar clearly defined by both valuation studies and studies about the bioeconomy in an effort to understand responsibility in the good economy.

‘Responsiveness’ in RRI terms is the capability of action to solve problems in an effective and long lasting way. This is probably the clearest feature discussed within valuations studies, as it directly implies action in the form of creating value. Valuations studies in its essence is all about understanding the economization done by practices becoming responsive. However, responsiveness in the bioeconomy is nothing if such valuations do not have an influence on the ‘bio’, meaning that they need to account for how life is under transformation and how it becomes part of an economic system. Literature on the bioeconomy helps to address this issue as it underlines the policies needed for making a social system frame the bio, and thus form the needed conditions for actions to be done. Studies about the bioeconomy aim to turn society more responsive. However, such effort has to be proven, shown in practice and clearly defined by solving current problems, meaning that the bioeconomy needs to be responsive. Such focus on responsiveness is important not only because of all the possible risks and unknown consequences that the bioeconomy may bring, but also because of the significance of the positive promises that it might signify for confronting today’s grand challenges (Asdal 2011).

4 Methodology

The methodological approach of this study is based on the material addressing the public debate and the process for the creation of a new law on genetic engineering in Norway. Choosing such material is relevant because the theoretical approach that this study follows is based on understanding the social responsibility of research and innovation within the 'good economy'. Thus, the primary source for understanding such notion must be within material that portraits how different type of actors enact their valuations on an issue relevant for the bioeconomy, such as genetic engineering. This shows that focusing on the 'good economy' not only enables to take concepts from valuations studies and studies about the bioeconomy for theoretical purposes, but also methodological.

4.1 Material used for the study

The study is based on material obtained from the public debate about the forthcoming new law on genetic engineering in Norway. The process, which was led by the Norwegian Biotechnology Advisory Board, provides a rich source of material as it took into account a large spectrum of national and international actors for over one year, from December 2017 to December 2018. Along with the organization of open meetings in Oslo, Bergen, Trondheim, Hamar, Tromsø, Ås, København and Arendal, Bioteknologirådet received 50 open policy letters and took into account key media outlets that discussed the topic and were published in Norwegian media during the specific period of time of the process.

It is important to clarify that this process was held outside the government's formal procedure protocols. Meaning that the conduction of the process or the information obtained from the process are not located in a governmental facility or webpage. The process was organized and executed by the Norwegian Biotechnology Advisory Board due to a majority call of the Board's members to reconsider the current law for regulation. All results and material produced by the Board were sent to the government after it was finalized and openly presented to the public.

Although the main type of material that I use for conducting the analysis in this thesis are texts, I complement the findings with interviews and participant observations. The main document that I analyzed is the *"Proposal for relaxation of Norwegian regulations for deliberate release of genetically modified organisms (GMOs) with applicability also for EU legislation",* which

was delivered by the Norwegian Biotechnology Advisory Board to the Norwegian Ministry of Climate and Environment in December 2018. This document is now being analyzed with the perspectives of being sent to the supreme legislature of Norway, known as the Stortinget, for being considered as a new law between 2020 and 2021. This document is especially relevant because it encompasses all open meetings, policy letters, and media outlets of the addressed one year process, and complements and discusses its findings with scientific facts and descriptions. The main questions asked in this document are the following:

- What should be regulated by the Gene Technology Act?
- How should these organisms be regulated?
- What are appropriate requirements for labelling and traceability?
- How should contribution to societal benefit, sustainability and ethics be weighted?

The analysis of this document is complemented by the examination of each one of the 50 open policy letters sent by diverse actors to the Norwegian Biotechnology Advisory Board. All these documents center the questions above. The open policy letters are from national and international public institutions, companies, research centers, universities, civil society organizations and independent individuals, experts and laypeople with specific interest on the regulation of GMOs in the Norwegian context. As it will be later discussed, some of these policy letters are written by a large group of recognized experts and/or institutions and are long documents presenting detailed technical aspects of the regulation, while other policy letters are simple and informal short messages expressing specific thoughts and/or emotions.

Besides the addressed documents, I have also taken into account in the analysis 30 media outlets compiled and published by the Norwegian Biotechnology Advisory Board depicting public debates and scientific publications directly relevant for today's GMO debate in Norway. The specific news agencies that were taking into consideration for gathering the news articles were VG, Nationen, Dagen, Teknisk Ukeblad, Romerikes Blad, Fiskeribladet Fiskaren, IntraFish, Firda Tidend, Møre, Fjordabladet, Dagligvarehandelen, Fagpressenytt and Kyst.no. The criteria for choosing these articles was done by the Norwegian Biotechnology Advisory Board itself. The Board defined them as the most read news sites by the Norwegian audience interested in

the debate for regulating GMOs. All these articles, along with the addressed policy letters, are publically available in the main webpage of the Norwegian Biotechnology Advisory Board[1].

4.2 The method used in the study

The main idea is to focus on the performativity of text as explained by Asdal (2015). Meaning that it is about analyzing not only the descriptions of what is being written, but mainly the valuations that are being performed by the text. Which in other words implies that "paperwork does not simply describe an external reality 'out there', but also takes part in working upon, modifying, and transforming that reality (Asdal 2015, p.1). It does not only reflect a given extra-textual reality, it in itself shapes the context in which it is part of. This is a technique known as the scholarly turn to 'materiality' described by Lemke (2015) and is seen as an application of how social scientists may take natural elements into their hands. This is important to note because there is a tendency of neglecting the fact that objects from nature are often accessed through texts to precisely understand what they are and define how they relate to their context.

This way of addressing texts should not be seen as a sort of relativism, nor a negligence of considering the opposite effect in which a document is also a result of its contextual settings. On the contrary, it could actually almost be seen as a sort of positivism, as texts are seen as part of reality, their relation with reality is not forged by chance, but it is built within that reality. Said it in another way, texts help actors define or negotiate a reality and then modify it (Asdal and Jordheim 2018). Consequently, texts do not obstacle or deter the understanding of reality, but they are an intrinsic part of that reality in the first place.

Within this discussion Foucault is highly relevant as to understand the performativity of texts. First because his work on the notion of the 'dispositive' served as a basis for developing the concept of 'inscription devices' from Latour y Woolgar (1986) which acknowledges the performativity of written material. Second because Foucault was explicitly interested in practices more than discourses, despite being renamed for his contribution within discourse and language analysis. However, what is interesting with Foucault's work is that it enables to undertake the law as a technologies of politics due to the indirect effects it creates by how the text is written, not only the direct regulations described by the law. It allows to see how the law through texts not only describe how things should be, but also produce the reality in which such

[1] Webpage with all the main material: http://www.bioteknologiradet.no/2018/12/genteknologiloven/

rules take place in the first place. Thus, based on Foucault, the making of the law through texts is a moral technology that enacts and takes part in modifying reality (Korvela 2012).

It is with this in mind that depending on the formulations and wording, texts have crucial and transformative effects, especially if the texts that one refers to embodies in itself a sort of authority (Constable 2014). Legal texts, but also scientific or academic, as dictionaries or expert journals, have especial transformative materialistic effects. So much, that depending on how they are composed, they can transform issues in distinct and sometimes radically different ways, even though they may contradict intuitive or logic perceptions of reality.

This is why at the end the important point is not the 'meaning' of texts, but the 'language in action' that is performed by the texts. The question is thus, how one can analyze the performativity of texts. Asdal (2015) provides an option. She explains that one alternative is to begin by paying attention to the main 'issues' under discussion. This especial attention on issues has become a quite important element of starting any analysis within STS (Marres 2007). The issue approach has been used to define how an object becomes worth to be studying depending on how it responds when being partitioned or divided, do to how it is contested, analyzed and questioned (Asdal y Marres 2014). By focusing on the issue, one is able to see how an object can be politicized, reframed or even turned into a non-issue in relation to the interplay of variables that modify concepts, actors, time frames, etc. (Marres 2005)

Understanding how an issue is being transformed can be done by defining the type of modifications that the text does on different elements composing the issue. In the article titled "*What is the issue? The transformative capacity of documents*", Asdal (2015) used the concept of 'modifying works' to stress the different type of analytical viewpoints that she uses for studying such modifications. Furthermore, in the article "Calculating the blue economy" Reinertsen and Asdal (2019) use the concept of 'an action-oriented document' as to describe how documents can enact valuations through specific features such as the type of authority performed by a document, the type of actors and interests involved or the type of genre used. For the case of this thesis, I have adapted this way of analyzing an action oriented document and defined 3 criteria for my analysis. The reason for which I have had to define my own criteria and not use the same as the two previous documents is because the material that I analyze is different regarding form, context and content.

It is in this way that I use three criteria which serve as guidelines for the analysis of all the text material. The analogy is that I will identify the valuation practices that the documents do by addressing the public concerns and visions of the common good that each document does. Meaning that the definition of each criteria is developed with the specific intention to identify different perceptions of public concerns and the common good in each document. The criteria used for defining each point was developed after I read for a first round all the addressed documents and made a preliminary analysis of the type of valuations done by each document. For a summary of the results of this process please see the appendix.

- **Criteria 1:** ***'the type of language'***, which refers to the written style and variety of terms that is used in each document. Given the type of valuations that the documents make, I interpret this criteria by analyzing two elements. 1) The degree of scientific language that each document uses. 2) The degree of political language that each document uses.

- **Criteria 2:** ***'the type of strategy'***, which refers to the specific focus and the way in which the valuations in each document relate to externalities. Given the type of valuations that the documents make, I interpret this criteria by analyzing two elements. 1) The willingness that each documents has to change the current law. 2) The willingness that each document has to regulate other technologies for engineering genes under equal regulations.

- **Criteria 3:** ***'the type of actors'***, which refers to the actors being addressed by the valuations done in each document. Given the type of identified valuations, I interpret this criteria by analyzing two elements. 1) The degree to which each document represents the interests of the industry. 2) The degree to which each document represents the public's interests.

Another element important to take into consideration when addressing the performativity of texts is acknowledging the fact that texts are always on the move and that this may have an impact (Asdal 2015). Circulating texts create tensions, reform ideas, establish or reform networks, etc. This is part of their capability to influence reality. Although also relevant for this study, this specific focus is not taken into consideration in the analysis because of the need to limit the scope of the thesis. It could have been interesting, for example, to know how the first version of the policy proposal written by the Norwegian Biotechnology Advisory Board influenced the valuation practices done by the policy letters written by the public to the Board.

4.3 Procedures and limitations of the study

The criteria defining each working point was done after a first reading round of the documents. This was important to do because I needed to have a general idea of all the topics being discussed by the documents before I could define the criteria for each modifying working point. This process took time as there were many technical points and many of them contradictory.

The first step for conducting the analysis was to use the previously described method about the materiality of texts to discern the main policy proposal written by the Norwegian Biotechnology Advisory Board, along with the policy letters and all the media outlets previously described. This work was done by filling out the information specified in each modifying working point done for each document in an excel worksheet. The resulting table formed by each modifying working point (set in the horizontal frame) and all the analyzed documents (set in the vertical frame) can be seen in the appendix. As already explained, each one of the ideas written for each modifying point in this table is considered to be an 'enacted valuation' done by the documents.

The first sub question of the study is responded by classifying and summarizing all the different enacted valuations done along all the documents. This was feasible because, as explained before, each modifying working point was developed with the intention to identify different perceptions of public concerns and the common good about GMOs in the documents. The result of this analysis is chapter 5, which is organized by presenting three main issues that are designed as three type of valuations were identified while I read for a first round all the policy letters.

The first issue (valuations on the definition) was determined as a consequence of applying the first criteria in the previous subsection 'the type of language'. I identified this issue as I saw that all the analyzed documents had in common valuations that focused on defining GMOs either on scientific or political terms. The second issue (valuations on risk assessment) was determined as I applied the second criteria 'the type of strategy'. This was due to the fact that most of the studied valuations focus on risk assessment in diverse ways. Finally, the third issue (valuations on publics vs. industry) was determined as I used the third criteria 'the type of actors'. The reason for this is that all valuations tend to define different type of publics and the biotech industry in different ways. Nevertheless, the logic behind the reasoning for each issue is explained on detail throughout the analysis done along the valuations chapter, along with a two dimensional graph that I have made a result of interpreting these criteria on all documents.

The data used for making each graph is shown in the appendix. I categorized each element of the criteria with a number between 1 (lowest) and 9 (highest) as a way to create a Cartesian plane (X, Y) to define where I locate each document. This enabled me to have a visual idea of how I have grouped the analyzed documents. However, I have done this simply as a way to visualize how is that I am doing the analysis, and a way to explain my observations. It has also been useful to describe and identified relations that would have otherwise been difficult to see. Thus, it is not that I use quantitative methods for the analysis, it is simply a tool for visualization. The table in the appendix also provides a short description of what I found for each criteria in each document. These summaries where helpful for revising data and making relations. Finally, I do not provide the names of the people who write the private policy letters, but identify them by a number. This is because of consideration to the current regulations from the 'Data Protection Services' in Norway (Personverntjenester NSD) and thus protection of personal data.

The second sub question of the study was responded by analyzing the identified valuations and analyzing them by using the notion of RRI and following the theoretical approach explained in the previous chapter. Meaning that this analysis is done by using the four guiding practices (anticipation, reflection, inclusion and responsiveness), which were established by the Norwegian Research Council and defined by Stilgoe et al. (2012). However, my analysis primary focus on the first pillar, anticipation, given that along the discussion I identify that most of the valuations enacted by the documents center on this practice.

The analysis done on chapters 5 and 6 is compared and complemented with a large and thorough literature review that takes into consideration the most renowned scientific research on GMOs. This was important due to two reasons. First because several of the valuations done by the documents did not explain the background information over which they based their assertions. Second, because the GMO debate is preyed by affirmations that are contradictory, and it is therefore essential to compare the valuations being done by the documents with scientific data. This was an unexpected development of the study, but became essential as I advanced while doing my analysis and having to interpret the notion of RRI to concrete verifiable ideas.

Given the type of material and the short time frame for conducting the research and writing this thesis, from June to October, there are several important limitations needed to be clarified. The first major problem is that the material used for understand the different manners in which diverse actors of the Norwegian society envision genetic engineering is restricted to what is disclosed by the Norwegian Biotechnology Advisory Board. Although this also has clear

advantages, as for example it serves as a guarantee for impartiality from my part, it also implies that the criteria for obtaining material is left to the judgment of the Board. One can speculate that some actors with interest in the issue of re-regulating GMOs are not taken into consideration because they were not able to send their inputs due to a lack of resources or misinformation. Specific sites that were not taken into account were student communities or pro-GMO and anti-GMO Norwegian activists who manifest their views through open blogs and social media groups such as: "Vi må snakke om gmo", "We Love GMOs and Vaccines", "Non-GMO Project", "Norge mot GMO" or "Nei til GMO i Norge" among others. The relatively large amount of people actively participating in these virtual spaces in Norway is evidence that there are many more actors' interest in this topic who did not form part of the addressed process.

Another aspect to consider is that the specific questions asked by the Board to the public where not directly about responsibility. As it will be discussed later on, they were about the technicalities of environmental and health impacts, labelling, ethics, social utility and contribution to sustainable development. Meaning that the material does not talk directly about RRI as such, but about public concerns and the common good about GMOs. The difficulty and subjectivity in interpreting such ideas into the notion of RRI are dealt with the specific STS concepts and theoretical approaches that were explained in the theoretical chapter.

5 Valuations

The following section reflects on the main valuations about public concerns and the common good that I identified after analyzing all the texts as explained in the methodology chapter. The resulting analysis is divided in three issues that are organized in three subsections: valuations on the definition, valuations on risk assessment, and valuations on publics vs. industry. I decided to divide my observations in these three main issues as a result of my methodological and theoretical analysis as previously explained. Each type of valuation is understood as an issue because of how it turns into a subject of investigation.

Furthermore, besides taking into consideration the valuations done by the analyzed documents, I develop my arguments with the support of a large literature research. This is done to describe the logic and background information of the valuations that are identified in the documents. Meaning that in this chapter I do not only explain my direct observations on the valuations done by the documents, but also discuss my observations with literature.

Also important to mention is that each of the following subsections is accompanied of a graph that serves as a tool for explaining how I have grouped the analyzed documents. These graphs are not a result of quantitative methods. They are simply a visualization tools that help me explain how I have been thinking while analyzing the valuations in each document. The groups that I form (G1, G2, etc.) are just relations that made as a result of my analysis.

5.1 Valuations on the definition

Figure 1 shows the way in which I have classified the analysed documents by considering how the identified valuations use scientific language on one hand, and how they use political language on the other. Interestingly, one can see that I have designated most documents with a high degree of political language, while just few are seen as using a high degree of scientific language. This is the reason for which most documents are located in the higher section of the graph. As I will identify along the analysis of this subsection, this is a result of the specific terms used in the valuations. Thus, the analysis in this subsection centres on describing the reasons behind this tendency, and on the literature review that I have found about the subject.

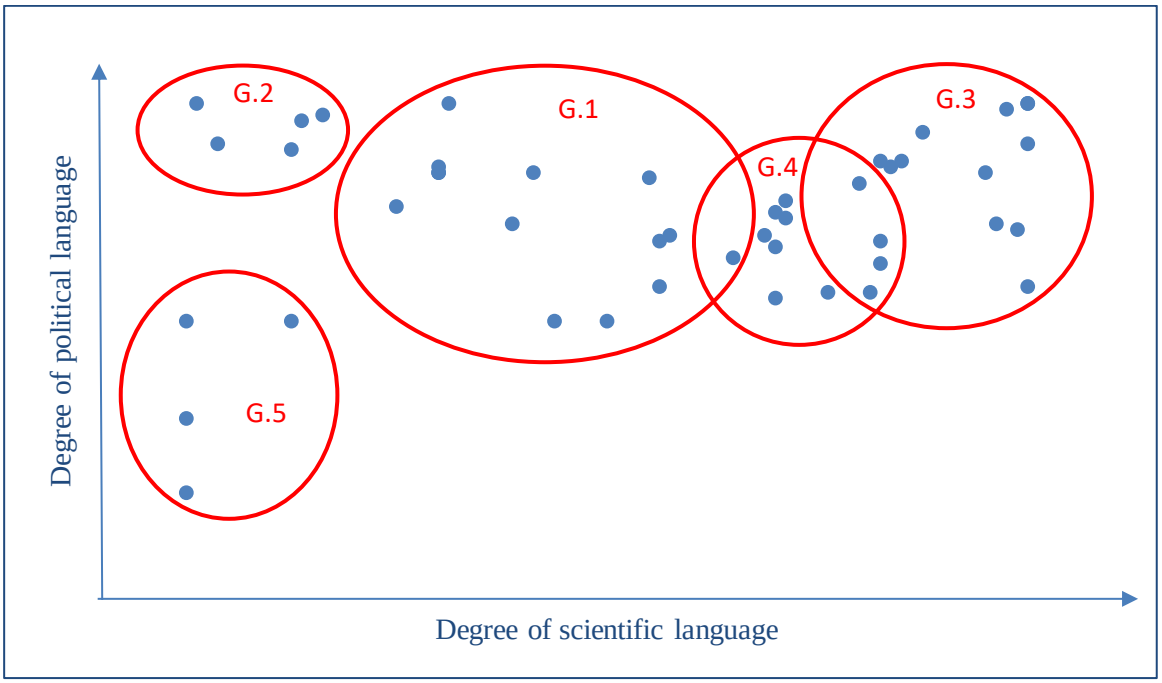

Figure 1. Graph depicting the position of the analyzed documents in relation to the degree of political and scientific language used along the identified valuations.

The most significant strategy used along two thirds of the studied documents is staged around valuations that refer to the comparison of GMOs with the natural development of organisms. This is because the Norwegian Biotechnology Advisory Board's policy proposal aims to categorize GMOs by their comparison to the natural development of organisms. As seen in figure 2, the first criteria is to define if the GMO which is being assessed could have also developed naturally or through conventional techniques. If this is defined as positive, the GMO that is being assessed is set in the first category (Tier 1). GMOs in which there have been genes exchanged from the same on similar species are set in the second category (Tier 2). GMOs which have genes from unrelated species or have synthetic genes are set in category 3 (Tier 3). This is a major change from the current law in which all GMOs, irrespectively from the type of gene being engineered, need to be assessed through the same process of evaluation.

The documents written by organizations such as Natur og Ungdom and Nettverk for GMO-fri (G.1) have strong valuation statements against changing today's regulations on GMOs. These documents address that genetic engineering is not just something that enables a change in the DNA sequence, but an interruption in the normal behaviour of a genome. This is based on the notion known as "genomic fluidity", which states that genes are not only individually defined, but rather must be seen as part of a relational complexity that is represented by a large functional network. Such notion is dependent to non-genetic adjustments as chemical process in the organism, and which affect the gen's functionality despite for not being directly manipulated.

These changes are normally not seen by normal scientific procedures when developing GMOs because risk assessments mainly focus on the phenotype. If the desired phenotype characteristic is achieved, it is assumed that the operation has been successful. No other evaluations or risk assessments are done (Buiatti et al., 2013). There is no consideration over the idea that the creation of a new organism can ultimately affect the conditions that surrounds it (Dyer, 2009). Obviously, this is not because scientists are willing to neglect this problem, but because there are no formal scientific procedures known to understand it. This is in the root of the problem about the distrust that the public has on scientist. Technologies be perceived by the public as artefacts that can develop and affect people in unforeseen ways (Akrich 1992). New scientific products can be used or evolve in new ways that create new risks unimagined by the scientists or engineers who design them (Moser y Thygesen 2014).

Exempted from GMO regulation Organisms with temporary, non-heritable changes	-
Tier 1 Genetically engineered organisms with changes that exists or arise naturally, or that can be achieved using conventional breeding methods.	Notification (confirmation required)
Tier 2 Genetically engineered organisms with other species-specific genetic changes.	Expedited assessment and approval
Tier 3 Genetically engineered organisms with genetic changes that cross species barriers or involve synthetic (artificial) DNA-sequences.	Standard assessment and approval (current requirements)

Figure 2 Categorization of GMOs for new regulation as illustrated by the policy proposal written by the Norwegian Biotechnology Advisory Board (2018)

The documents such as those written by Oikos and Kirkerådet (G.2) go further and criticize leveling genetic changes done by genetic engineering in a lab with natural genetic changes done by nature itself. They state that the fact that there is human intervention in the process makes it unnatural per definition, and this should be questioned on moral and ethical terms. Meaning that these documents enact an ethical valuation that is based on the understanding that the meaning of 'natural' is nature not disturbed by humans. As with their valuations about public concerns and the common good, they emphasize the need of society to live along nature's premises. However, what is nature? Latour (2004) explains that this depends on the vision from which we construct reality. If it is relativist, reality is built on the sense that nature is the

consequence of the settlement. While if it realist, reality is built on the sense that nature is the cause that allowed controversies to be settled.

The major problem is, of course, that the concept of "natural" can be used in many different ways. Fourcade (2011) argues that the concept of 'nature' is socially built from all the things that transform reality and are dependent to the valuations of each actor. The valuations done by several of the analyzed documents are based on the idea that GMOs cannot be equalized to organisms exchanging genes in nature. They state that this is because of the difference that the role of time makes in the genesis of biodiversity and the assessment of the natural mechanisms that sustain organic evolution. They explain that the kind of genetic modification done through engineering disrupts the biological time necessary to stabilize varieties and the evolutionary process and history of biological interaction. In other words, it violates the fact that traditional varieties of food have had to be developed through a farming culture within specific environments and challenges within a community (Villa 2014). Accordingly, aligning genetic engineering to traditional procedures is a reductionist, obsolete an irresponsible idea. Interestingly, in contrast to the previous perspective, the mentioned documents accept that most organisms sold in our markets are not the original genetic versions of themselves, but have been modified by humans and continue to do so. It is just that these modifications are done through well-known processes that are not based on a laboratory, and are categorized as "safe".

In contrast, the documents written by NTNU Vitenskapsmuseet Institutt for naturhistorie, Universitet i Oslo and Institutt for Biovitenskap (BIO), Universitetet i Bergen (G.3) state that GMOs should be compared with natural processes, along with risk assessments and potential uses, but from a biological and molecular level. They explain that when studying organisms at a molecular basis, many organisms with gene material formed by the combination of different species can also develop without human interference. One of these documents even explains that for example sweet potato is a naturally genetic modified organism, just as many type of corn grown organically by small farmers (Kyndt et al., 2015). Likewise, "specie" is not well defined by science given that there are many exceptions to the common definition of 'groups of individuals who can reproduce with each other' (Li et al., 2014). More importantly is the fact that in some cases the gene flow between individuals of two different species can be higher than between individuals within the same specie (Hey y Pinho 2012). The point is that nature is constantly in a process of re-engineering itself, trying constantly to adopt genes of all kinds as a natural way to evolve (Yue et al., 2012). These scientific documents suggest that seen with

microscopic eyes, at a molecular level, this 'natural gen engineering' is exactly the same biological process as when it is done with genetic engineering in a lab. If one could see both biological processes in a parallel manner, one would not see any difference. These documents make their valuations with a strong scientific authority due to the type of research institutions they are and the legitimacy they have of the researchers signing the document. Moreover, this authority manifests as well by the way in which they write the documents. The message is backed-up with key literature, which permits the reader search for more information.

Several documents seem to understand the definition of GMOs depending to the type of techniques that they include to be a GMO (G.4). All documents acknowledge that the main reason for discussion of a new law is the fact that the new techniques for gen edition, such as CRISPR, have brought new opportunities and challenges not addressed by the current law. However, the documents written by Oikos, Norsk Bonde- og Småbrukarlag (NBS) and Norsk Landbrukssamvirke (G.5) stress the fact that they have been in use only since 2012, and although more precise and accurate, they have not had enough testing time. Other say that CRISPR is not even technically a GMO, like the regulations of Sweden or Finland consider. In any case, most documents state that the new technological developments present different type of potentialities and risk that need to be seen in a case-by-case basis. Thus, their differentiated effects are better seen within the different categorization as proposed by the Board.

The main point of confrontation among documents having contrasting valuations (G.4 – G.5), however, is not about the new techniques, but about the ones already in use, which are normally defined as conventional, but can also be organic. Examples of such other techniques are mutagenesis, triplodisering, gene silencing, embryo rescue or cell fusion. This is because most documents acknowledge them as safe and consider that they do not need to be regulated. The technical term used by the policy proposal written by the Board is they have a "history of safe use". Nevertheless, the discussion of what techniques are to be included and which not is in its essence political and economic. The production and commercial consequences of regulating conventional techniques which do change the genome would be tremendous. The major irony is, as explained by the document written by the German Federal Office of Consumer Protection and Food Safety, which many of such conventional practices present technically larger potential risks than the same product done through genetic engineering. It is not only that most of these techniques change genes randomly (and thus much more difficult to define their risk), but also that they have a proven larger genetic impact on the organism. The document written by the

Board explains that salmon treated with triplodisering has been successful, but the resulting salmon is susceptible to being sick, needs a slightly different diet, and needs a different temperature of water (Fraser et al., 2012). The biggest problem may be that such fish endures a radical gen impact were 45000 of its genes are randomly changed.

Finally, the definition of a GMO can vary along the productive chain. This comes up while analysing the contradictory valuations done by the analysed documents in how to interpret the problematic issue of labelling. Interestingly, these documents cannot be integrated in one unifying groups as with the other documents as they appear dispersed when addressed the type of language they use. A major problem is that while a seed used for a food may be defined as a GMO, the final product made with that seed may be categorized as non-GMO. This because the GMO seed in the final product is mixed with other ingredients so that at the end it only accounts for a relatively small percentage of the final product. Most food products in today's market, all over the world, have a percentage of GMOs as ingredients (Borrell 2016). There is also the situation in which many food products depend on GMOs for the process of production, but never actually use GMOs in the product itself. For instance, about 90% of all cheeses sold in western markets (also Norway) are made with an enzyme named chymosin, which is a compound only produced with GMO-microbes (Entine y XiaoZhi 2018). Consequently, two final products may be defined as one being a GMO and the other as non-GMO, but be chemically, physically, biologically and even genetically speaking exactly the same.

As a general conclusion, one can see that the analysed valuations have a tendency to be political. This is because of the type of language they use, but also due to how they justify their positions. It is clearly seen that most documents centre on what is to be natural or not, and on the political meanings of this term. This is seen on valuations taking ethical and technical perspectives, and its relation to other key aspects as risk assessments, benefit projections, or the implications of using other technologies. Interestingly, this political tendency seems to have a tendency of trying to be more proactive. The documents against deregulation do not argue for banning GMOs, they focus on being preventive of what may happen if 'risky GMOs are not set as risky'. In the say way, those documents in favour for deregulation argue in an effort to foresee the potential benefits of GMOs. Meaning that in both cases, the valuations of the documents are proactive in trying to understand what may happen in the future once GMOs are approved.

5.2 Valuations on risk assessment

This subsection is also based on an analysis done by how the analysed documents are positioned in Figure 3. The criteria is to conduct the analysis on the basis of defining the willingness of each document to change the law and to regulate other technologies which also modify genes in an equal way. Accordingly, one can see that there is a high dispersion along the graph. However, there are two interesting tendencies that I have identified. One referring to the willingness to change the law and its relation to risk approach. Another one referring to the willingness to regulate other technologies due to how documents make valuations on labelling, which also is a consequence to how the documents have valuations on risk assessment.

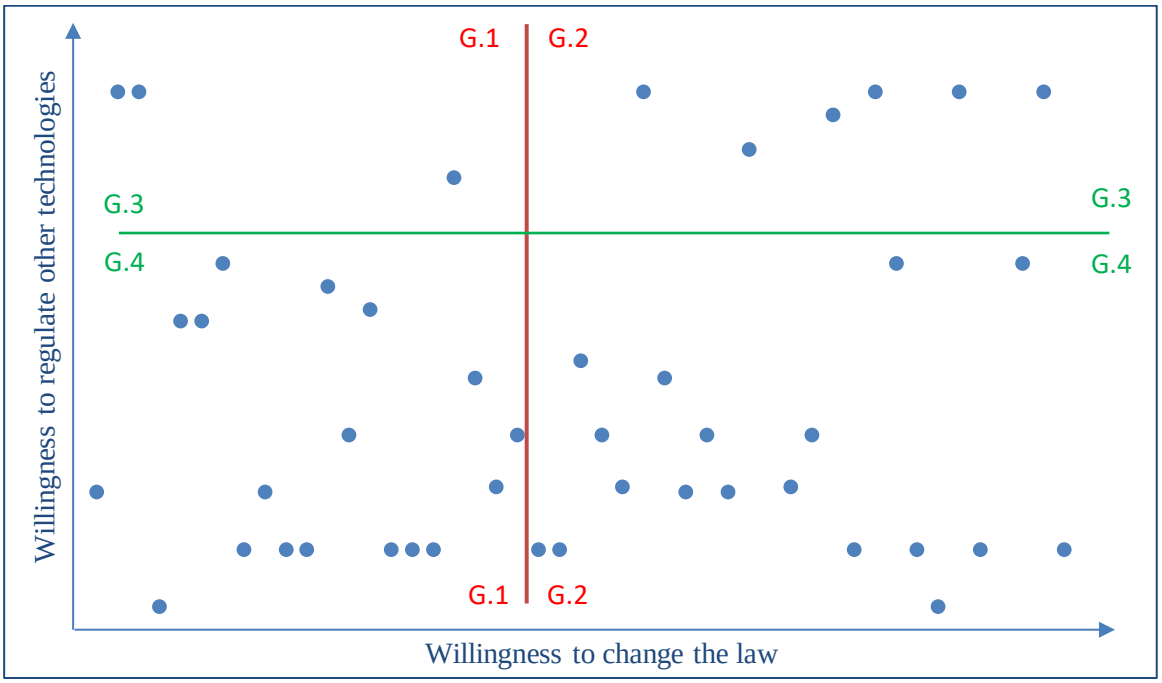

Figure 3. Graph depicting the position of the analyzed documents in relation to the willingness of each document to change the law and the willingness of each document to regulate other technologies.

Risk assessment is the key matter in which all the analysed documents centre their valuations. While they all acknowledge the importance of the Precautionary Principle, they perform different type of valuations upon it. Some documents focus on the need to not accept GMOs at all until there is a clear and convincible evidence of no risk. These documents can be identified from the red line to the left (G.1). While other documents encourage to conduct risk assessments, but state that there is no reason for not using GMOs as long as there is no evidence or feasible likelihood of risks. These are the documents seen from the red line to the right (G.2).

The policy letters from Nettverk for GMO-fri mat og fôr, Norsk Bonde- og Småbrukarlag and Kirkerådet (G.1) underline among others the need to develop more knowledge about the risk to be taken by using GMOs. They argue that there is no need in Norway to use a technology over which there is not enough information and experience. Consequently, the use of GMOs should only be done once all possible risks have been considered and measured. This is what the current law does along the five elements of analysis (health, environment, ethics, social utility, and sustainability). They state that this needs to be done given the large potential negative consequences one may have by approving a GMO. Some of them also claim that the lack information is not only on the technology, but also about the ecosystem that is thought to be intervened. Interestingly, many of the documents following this line of thought do not provide specific risks or cases, but focus on what is not known. The core of their argument is that small changes in the genome can lead to large unknown consequences for an organism or ecosystem.

Contrary to this type of argument, the policy letters such as those written by Norsk Industri, Nofima and NHO Mat og Drikke (G.2) underline the idea that there is an urgent need to take advantage of the benefits of GMOs. They stress the fact that today's social grand challenges pressure the need for the development of new technologies that can provide benefits in the mist of potential risks. These ideas on the social utility of science and risk resonate with RRI policy frameworks. The alternative principle they appeal to is named "proactionary", which underlines the criteria that not taking a risk also implies that one is taking a risk in two different ways. First because of the lost opportunities that implies not using a technology that can reduce costs and conduct more effective lab experiments, which could signify facilitating innovation procedures and the possibility to expand into new markets. Second because losing opportunities in the mist of grand challenges, as climate change and food security, may imply having to use other technologies that might imply taking even higher risks.

Consequently, the type of valuation being done by the all these different documents is reliant to how they approach risk, but which also define how they approach possible benefits. Interestingly, the documents stressing the idea of maintaining the precautionary principle, seem to have a tendency to enlarge public concerns of potential unknown risks for the common good. They do this by stressing the idea that there is not enough information about negative impacts. While the documents promoting a change towards the pro-reactive principle underscore the positive potential uses of GMOs relevant for public's concerns and the common good. They also state that there have not been found any demonstrable negative impacts. In both cases the

public is used as the final cause for justifying their valuations. This is of course an old tactic already well-studied by Foucault's interpretation of Machiavelli in his famous lecture on governance (Korvela 2012). The public good is the means of justification independently to what ideology or specific social development one may envision. The logic behind is that stigning the public legitimizes any action upon the public.

Almost all the analysed documents take a valuation stand on the need to follow the public's clear demand on labelling GMO products. The main point of discussion is how the information should be presented. Some of the policy letters propose that the label should simple say if the product contains GMOs or not. Others would like that the label specifies the category or Tier of the type of GMO. Another group proposes to use QR-coding as a way to allow customers scan the product with their telephone for detailed information. Finally, another group of documents state that given the complexity behind the concept of GMOs, labelling would misinform customers rather than help them understand what is that they are buying. They also state that most foods have a percentage of GMO within its components, and it is logistically difficult to detect GMOs within most production chains. They also explain that labelling hinders international commerce given the different label regulations that each country has. Nevertheless, all documents arguing for labelling state that there are rules for defining what percentage of GMO is acceptable (usually 0,09%), that the detection is technically possible and feasible, and it is on the people's democratic right to know what they are eating.

Another element about risk assessment that arises within the studied valuations on labelling is the political implications. Giving that there is no international regulatory system for labelling, it is up to each country to define how labelling of GMOs will be encountered, as stated in the Codex Committee on Food Labelling. The European Union has as regulation that GMO food should be labelled if they have more than 0.9 % GMO products within the final product, South Korea has it at 0.3%, and Brazil 1%, while in Australia there is simple no difference between non-GMO and GMO foods. Rao y Gruère (2007) explains that countries guided by the precautionary principal have a tendency to develop strict laws for labelling, while countries guided by the product-based evaluation principal tend to not have labelling laws. This has direct consequences on consumer perception, market dynamics and production regulations. Consequently, label laws created by the precautionary principal tend to make the public focus on the probability of unknown risks, and thus create general scepticism. While countries that do not have label laws have shown to have a tendency of maintaining consumers unaware about

the fact that GMOs are present on most food they eat. These tendencies do correlate with what it can be found along he analysed valuations, also symbolized by how the documents can be separated in the two addressed groups G1 and G2.

What is interesting with the valuations on labelling is that there are two main types of arguments. There are documents stating that labelling GMOs should be done on the basis of the process it has been through. While another documents rather state that labelling should be done on the basis of the final characteristics of the product. The documents promoting the idea that risk assessments should focus on the process, have strict perceptions of denoting if there has been use of genetic engineered or not, as they stress that the risk is in the use of the technology itself while making the product. Thus, they are not necessarily focused on the final characteristics of the product. On the contrary, the documents stating the need to focus on the final product tend to make no differentiation if the product is GMO or not, and rather focus on the risks of the final characteristics of the product. Meaning that they focus on the consequent effects that can be caused by the change in the genes present in the final product.

This differentiation of assessing risks on the basis of the technology used in the procedure or on the characteristics of the final product, is relevant for deciding if including (or not) other type of technologies which also affect the genome. What is interesting is that the documents focused on the procedure also tend to argue for not having to regulate other technologies that also change genes. These documents are located on the lower side of the green line. While the documents focused on the characteristics of the final product tend to state that other technologies should be also regulated equally. These documents are located in the upper side of the green line. However, these are just tendencies that I identify, it is not true in all cases.

Finally, most of the documents do not have statements arguing that GMOs cause physical harm to the environment or human health. Rather, the risk perception of the documents aiming to restrain the use of GMOs focus on sociotechnical issues such as social utility, sustainability and ethics. This is clearly seen in the policy proposal from the Board. However, there is neither a direct accretion about the opposite, the fact that no GMO has ever been proven harmful. Nevertheless, the document written by the Board focuses on the potential benefits of GMOs. The general main message is the need to explore the positive side of the new technology as a way to compete with international market forces and support Norway step into the bioeconomy.

As a conclusion, one can see that all documents centre one way or another on 'risk assessment'. However, although they all documents begin by invoking the Precautionary Principle, they all have several different type of valuations about how such principle should be approached. The analysis of the willingness to change the law that each document has shown to have, shows that it correlates with the documents willing to take risks. This also is true for the contrary tendency in which the documents having lower willingness to change the law, tend to address the need for more information of potential impacts. Furthermore, while analysing the willingness that the documents have to regulate other technologies, one can see two tendencies. On one hand, the documents focused on labelling on the basis of the procedure, tend to argue for not having to regulate other technologies that also change genes. On the other hand, the documents focused on labelling on the basis of the characteristics of the final product, tend to state that other technologies should be regulated equally as GMOs.

5.3 Valuations on publics vs. industry

In this final subsection I take into consideration the third criteria, 'the type of actors' and base my analysis by addressing figure 4. Thus, I take into consideration the degree to which each document represents the interests of the industry on one hand, and the degree to which each document represents the public's interests on the other. Taken into account these two elements is very illustrative because it allows to see the high degree to which the public is addressed along all documents and compare it with the degree to which the documents address industrial interests. Interestingly, as seen in the graph, the industrial interests are represented just in some documents, while the public's interests is basically present in all.

All the valuations done along the analyzed documents discuss in one way or another the relation that the industry interested in GMOs has with different type of publics in Norway. Most documents tend to base their valuations by setting private companies on one side, and small farmers and civil organizations on the other as if they were representing opposing forces of society. Other documents rather promote the importance of the industry in serving the public, and present GMOs as a tool that may make this relation more evident. However, in most cases, the valuations have a combination of these two visions, thus separating them as two should only serve as a strategy for analysis, not as a representation of reality promoted by the documents.

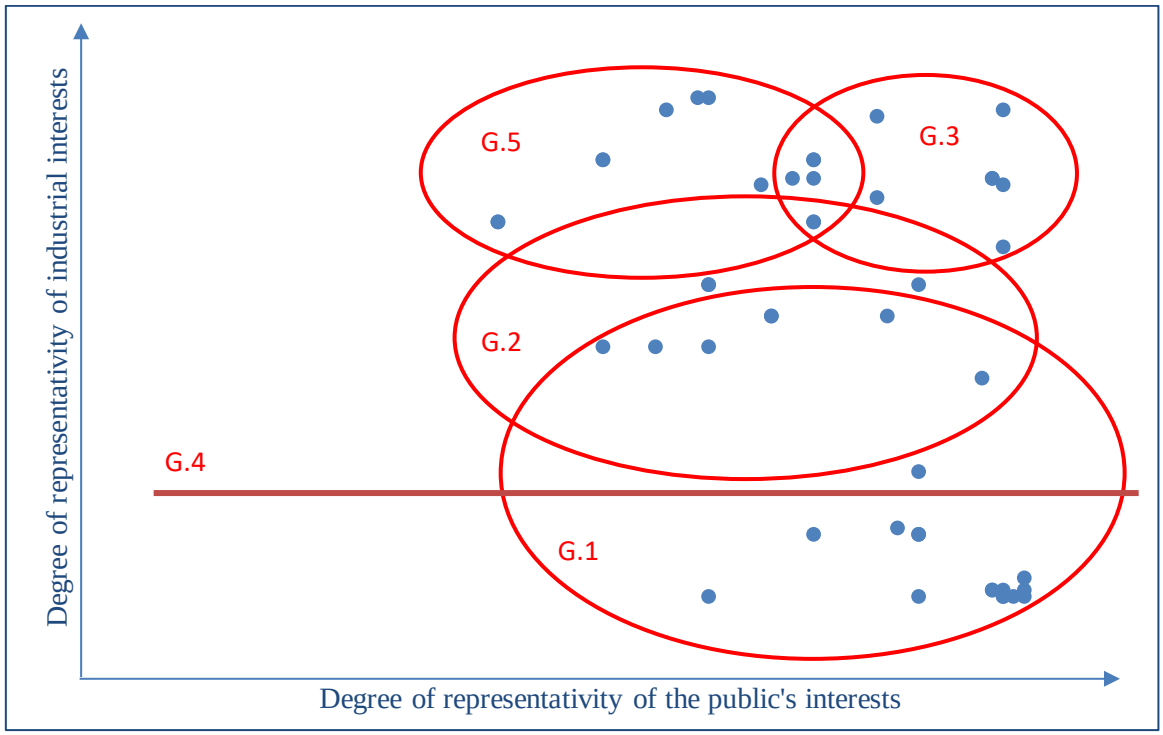

Figure 4. Graph depicting the position of the analyzed documents in relation to the degree that each document represents the public's interests and the degree to which each document represents the interests of the industry.

The vision of setting the industry as an opposite to civil society is promoted by documents such as Norsk- Ryggvoll Melkeproduksjon, Gartnerforbund and Natur og Ungdom. These documents are defined as having a strong focus on the public's interest (G.1). Within this view the underlying idea is that GMOs are a technology embodying a neoliberal agenda that provides the upper hand to large companies in acquiring both economic and political control. They underline that it is irresponsible to not recognizing that GMOs and the agribusiness (especially corporations) are one of the same kind. Entailing in other words that GMOs are a technology that is designed to empower corporations on the expense of the common good. The common good in this sense is reframed as the need to support the right of farmers to produce GMO-free food as an imaginary for a fairer, cleaner and more ethical way of producing food.

This type of valuation is in tone with a Marxist Foucauldian approach in which biotechnology is seen as a technology controlled by capital and thus a specific mode of production that appropriates life to itself. It is in other words the capitalization of life through the use of new technologies born from capitalist's forces. At its very core, this is a discussion about technological determinism, which states that technology develops outside society (Wyatt, 2008). The actors arguing that GMOs are hand-in-hand with the agribusiness have a nomological perception of technological determinism. Meaning that they believe that GMOs project themselves only one way that only flavorous the differentiation of social classes. The

underlying idea is that the empowerment of corporations has shown in several countries to work against the interests of small scale farmers. This has been especially worrisome in developing countries where large volumes of GMO crops are being produced nowadays and local governments have little means to control corporations (Catacora-Vargas et al., 2018).

The Centre for Food Safety states that the agro biotech industry prioritizes the promotion of GM crops because it is through this technology that they are able to guarantee large sales (AFSA, 2018). First because the GMOs they sell are exclusively dependent to the inputs they are the only ones allowed to sell. For example GM Monsanto seeds designed to survive the use an herbicide (RounUp) only sold by Monsanto. Second because the GMO seeds are protect by patents and specific contract regulations that obligates farmers buy the same seeds every year. Meaning that besides losing their traditional seed independency, farmers are threaten of being sued in case the company finds illegal GM seeds in their land. In turn, these studies argue that this situation tends to make farmers develop large debts, lose their properties, become day-labour workers and at the end push them to migrate towards urban centres (De Schutter, 2011).

Major decisions done in Norway have been based on this technological deterministic vision. Actually, the main reason for denying the approval of one GMO maize and three canola plants in Norway was based on this logic (Miljødepartementet 2017). The majority of the documents making valuations aligned with this criteria are civil society organizations and farmer associations. This is relevant given that these kind of organization have high trust among the public in Norway, especially on environmental issues. This is a tendency explained by Yearley (2005) who states that NGOs are considered normally by the public as the most trustworthy source of information, also for scientific knowledge. The main reason for this is that they are perceived as the most ethical grounded with the public's interest. However, the issue with ethical discussions is that they are co-constructed between social and technological elements within a context (Druglitrø 2018). Meaning that it is dependent to the priorities of a specific society, space and time. Thus, as stated by Heggdal and Langberg (2016) one could argue that this technological deterministic vision over GMOs has been built in Norway mainly because of the influence of local NGOs. As a consequence, the GMO debate in Norway has been set within several social circles as an issue of ethical means and thus resistance, making it difficult to make a positive view over them. As said by Felt and Fochler (2013), this is important to consider given that it is difficult to tell a story that does not go with the common idea of what is considered to be as politically correct within a specific context.

Other documents denote that the responsibility in this issue relies in recognizing that the relation of GMOs to agribusiness is just a socio economic and historical issue which has taken advantage of a technology and the regulatory frameworks developed around it. Meaning that the technology in its self does not embody an economic and political agenda. This perception is aligned with the social construction of technology from (Pinch and Bijker 2016) who say that artefacts can have different meanings depending on the context in which they are being used. The success of the artefact is dependent to the actors who are behind it and not about the main features of the technology itself. Accordingly, GMOs can be part of different models depending on the context in which they are being used, this is called "interpretative flexibility". It is all about the technological frame or technological script that are behind the development of GMOs.

Documents aligned with these perceptions state five main reasons to explain why the over empowerment of corporations over farmers is a consequence of political socioeconomic conditions formed around their context and not the technology itself. First, most of these documents imply that GMO and non-GMO products being produced side by side have the same kind of sociological problems, showing that in this cases the situation is recurrent for the local context, not the technology. Second, some infer that the problematic conditions of small farmers in several places where GMOs are being used are the same as in places where GMOs are prohibited, leading to the same conclusion as in the first case. Third, some documents state that the socioeconomic problems that GMOs are accused of causing have not developed in several places where GMOs are exclusively used. Fourth, some few documents indicate that many GMOs have been designed to have a direct positive impact on the common good as in the case of Golden GM Rice (Dubock 2017b). Fifth, they state that there is large evidence indicating that GMOs have shown large benefits to farmers of all sizes and conditions, even in developing countries. The problem would seem to be that the focus for understanding the socioeconomic difficulties that farmers experience is exclusive on the GMOs, and not on other technologies. This is because these other technologies are already well accepted in society, while GMOs are seen as new, and thus seen as probably having consequences that are yet not known.

There is another group of documents that do not contradict directly the anti-corporate vision, but do address that the corporative model over GMOs has also had positive impacts for farmers. These are the documents represented as having a strong degree of representing the interests of the industry (G.3). Interestingly, as seen in the graph, this group is also seen as representing with a quite strong degree the interests of the public. This is because they imply that such model

has incorporated small-scale farmers into corporate value chains through contract farming (mainly for export), and provided them with direct support through subsidised inputs and infrastructure. There are several indicators that the agribusiness model has enabled farmers to become part of a larger market and distribute costs more efficiently. These documents also imply that although it is a fact that owners who expand their land are more likely to use GMOs, they do it because it is cheaper, less toxic, and easier to handle, not because they are forced. These perspectives are aligned with the findings of the National Academies of Sciences et al., (2016). Most farmers who use GM seeds maintain that they prefer to purchase seeds every year because new seeds generally grow better and demand less inputs. Meaning that they decide to buy these seed regardless the issue that they are patented. In other words, farmers act as any other type of businessmen, they take the option that provides them with the highest net income.

Several documents also mention indirectly that many scientists complain about the restrictive access resulting from patents owed by large corporations. This group is also aligned along the documents having a strong degree of representative of the public's interests (G.1 and G.2). This critic is important given that seeds cannot be used for research without the approval of the company which owns them (Pollack y Shaffer 2009). Agro biotech companies explain that patents are necessarily to protect intellectual property from competitors and piracy, but critic say that they limit the promise of the so called Open Source GMOs. Nevertheless, Monsanto says that they have agreements for Open Access with more than 100 universities in the US, but the criteria for why and how they choose which universities and scientists they will work with is not clear, and may rely on internal interests (Johnson, 2014). In any case one of the documents indirectly reminds that the issue of patenting is temporal. Besides, one the links provided by the Board to search for extra information about GMOs and patents, explains that there are nowadays GMOs which are not patented, but made by public institutions so that they can be used without having to request any license (Regalado 2015).

Several of the valuations done by the analysed documents mention that the over focus on GMOs and their relation to agribusinesses has neglected the need for attention on other forms of production or technologies. They address that this is not only a negligence from researchers, but also among producers, politicians and the public in general. These document cannot be represented in the graph as one united group as they very dispersed due to the used criteria. This critic correlates with most research I found on the topic. In an international perspective, production models that are based on agro-ecological or organic techniques do not have the same

type of investment or engagement from the scientific community (Friends of the Earth, 2017). This despite the fact that 70% of the world's population eat from the production of peasants and small-scale farmers who normally do not use GMOs (Villa 2014). The importance of considering the effects on non-users in the issue of GMOs is consequent with the feminist observations of Star (2001) in which it is important to foresee potential problems for not users or groups outside the network around the artefact under concern. The so called lay-end users who are silent and not present but affected by the action are also affected by the valuations being done (Wyatt, 2003). This is important as there is a tendency to have a so called executive approach in which one only gives attention to the actors who have power (Law, 2001). However, some documents explicitly explain that other technologies, such as organic and conventional farming, can be even more toxic for the environment or human health than GMOs.

About three fifths of the analyzed documents support the idea that there is a need for strengthening private industrial actors in Norway to research and innovate GMOs. This group is symbolized in the graph by all the documents located upward from the red line (G.4). Several documents, such as those written by Graminor, Legemiddelindustrien and Heidner-Biocluster, promote the role of local private actors as to the potential significance that GMOs would mean for competing in the international market and the possibility to provide higher quality of products to the local population. It is in this regard that the valuation on the public's concerns and the common good is seen as a final beneficiary of the development of the local private sector in Norway. This is defined by the potential higher quality of products, the reduction of production costs that would translate to lower final food prices, and the ecological benefits of GMOs designed to encounter environmental problems.

Another valuation performed by several documents is how they position large corporations against start-up initiatives. These documents are located as having a high degree of representatively of industrial interests, but refer on small scale enterprises (G.5). Although all these documents are in favor for deregulating GMOs, they perform different valuations on the type of regulations they promote. This is because there has been a tendency during the past decades in which stricter regulations have helped large corporations over smaller ones (Maghari y Ardekani 2011). This is because the larger the entity is, the more likely it is to endure high costs and large time laps needed for approval. Documents such as 'Norges miljø- og biovitenskapelige universitet Fakultet for Biovitenskap', 'Institutt for Biovitenskap', 'Universitetet i Bergen' and 'Universitet i Oslo', echo the fact that most potential positive uses

of GMOs are more likely to come from small companies or even public institutions such as universities. This is mainly because of the idea that smaller entities need lower financial gains to survive, and are therefore more likely to not have a top down relationship with farmers. It is also thought that local initiatives with specific needs that are willing to invest in GMO lead solutions, and are thus likely to have a high positive impact, are likely to be small. Likewise, public institutions like state owned research centers are more likely to develop products responding to public concerns and the common good.

As a conclusion to this subsection, one can see first of all that the public's interest is highly respected and addressed along all the valuations done by the documents. This is done along two major tendencies. Some documents sett the public's interest against the interests of the industry, and argue along the terms that GMOs should be addressed within technological deterministic perspective. Other documents aligning the public's interests with the interests of the industry, and tend to have their valuations along the ideas of co-production where both technology and social factors influence each other. Interestingly, there is no case in which a document does not acknowledge the public's interests, and all use the public as a way to state their argument.

6 Discussion

In an effort for responding to the second sub-question of this study, this chapter is a discussion that takes into account the previously identified valuations and relates them with the premises of RRI. Meaning that the following subsections reflect my analysis on how the discussed public concerns and diverse visions of the common good resonate with RRI's framework. Hence, I begin each subsection by addressing the three type of valuations previously identified.

6.1 RRI and the political definition of GMOs

The new law proposal written by the Board does not have a clear definition of what is to be considered 'natural' and not, nor does it reflect on the incongruences of using 'species' as a basis for categorizing GMOs'. This is probably the reason for which there is a large variation along the analysed valuations about how the notion of 'nature' is to play a role in re-regulating GMOs. There are documents which aim to take a technical and strictly pure scientific definition of what a GMO is, while there are other documents which rather prefer to have a socio-cultural account of it. So, it is not just that "the notion of nature is in the very nature of the GMO debate" as addressed by a participant in a debate in Oslo[2], but mainly that the Board has created this situation as a result of the type of language they use in their policy proposal.

Part of the problem is that scientifically speaking there is no such thing as a "genetically modified organism" or GMO. Most scientist agree that it is practically impossible to define GMOs as a concept since there is no common denominator for all the organisms named as GMOs (Tagliabue 2016). This is because the concept of genetic modification is a process, not a final product. It is a social constructed term just as gender or race, and thus subjective. Most of the analysed documents address GMOs as a term that refers to plants, animals or microorganisms, such as bacterial, parasites and fungi, which have new traits created by modern genetic engineering. However, there are many technicalities that can be defined within or without this main conceptualization, all depending on the 'politics' of who defines what (Johnson, 2014). This is clearly seen along the variety of ways in which the analysed valuations relate GMOs with the notion of 'nature'. In one way or another, the definition turns political.

[2] Open meeting in the Literature House Oslo December 2018 organized by Bioteknologirådet

To make this situation even more complicated, a new technology known as re-wilding, provides a new angle to what is natural and not, and thus how responsibility should be understood. Researchers from the University of Copenhagen have created a new technique in which they use genetic engineering to make plants that are currently sold in the market as natural into their original natural form. The situations is that almost all plants (if not absolutely all) that are sold in today's markets are not the natural versions of themselves, but genetically speaking different. They have been genetically modified either organically or through conventional techniques. Thus, this new technology is capable to use genetic engineering to modify the plants to their original genetic natural state. In other words, it take genes from ancient plant varieties and puts them back to 'today's natural plants', creating 'real natural GMOs' (Davison y Ammann 2017). This technology is not taken into consideration by none of the analysed documents, but there is no doubt that it falls in a grey zone of the proposed law and by how many of the studied valuations address GMOs, as it is both completely natural and non-natural at the same time. Meaning that even the 'most techno-scientific explanation' of nature ends being interpreted by subjective or, better said, political interpretations of what is to be natural or not.

It is in this sense that even the documents making the hardest effort to hold a scientific stand and probably define themselves as apolitical, are unable to be completely politically neutral. This may explain why all documents are considered for having a high degree of political language in Figure 1. The technical focus of the most scientific documents ends up having to address the use of idealistic perceptions of nature, making them have a political stand. Thus, the valuations making an effort for separating ideologies from scientific facts turns illusive. This is because they are attempting to separate science from politics as in the typical canonical point of view of science (Weber 1946). A vision where formalization is understood as science that is a result of methodological evidenced based criteria and thus dependent on how science is done (Head 2010). While separation is understood as science that is dependent to the expertise of who makes science (Jasanoff 2003). However, authors such as Callon et al., (2009) or Lidskog and Sundqvist (2015) state that this effort is illusory. Approaching science and politics as two different and unrelated blocks is not only not possible, but also undesirable as they are simply different sides of the same thing and dependent to each other (Sundqvist et al., 2015).

The political side of the studied valuations can be clearly seen not only as how they approach 'nature', but also on how they approach potential impacts by deregulating GMOs. In one way or another, they all tend to base their valuations on politically anticipating future consequences.

Even among the documents arguing for not deregulating GMOs, one can see that they base their valuations on discussing the difficulty or problematic encounters with preventing impacts. These valuations are not based on considering technical aspects of GMOs, but on political positions of how they define their concerns and visions of the common good. As seen in the previous chapter, the Board itself writes its policy proposal on the basis of political means, and not only scientific terms. It is within this regard that the Board seems to be trying to serve as a boundary organization in which it aims to join the valuations done by most the documents they received. In other words, one could argue that the Board in trying to be inclusive in its effort for taking on board diverse type of valuations into account. An effort for being fair to what a large portion of the public wants and by addressing how they use their political language.

It is not strange to consider the Board as a boundary organization due to the mandate they have. A boundary organization is an entity which has as a role to create a link between science and policy (Sundqvist et al., 2015). For example, the IPCC is a boundary model organization that has been able to successfully create its image by being on the side of a classical hard science, and then reach the political spectrum (Mahony 2013). This way of relating science to policy is regarded by many as the safest strategy to gain the public's trust and the most efficient way to create change (Fiske and Dupree 2014). However, Sundqvist et al., (2015) argue that the IPCC's latest reports are actually based on a different approach. One that is not based on formalization and separation, but on a mixed-mode approach where government representatives are given a privileged position, while also letting scientists be independent. This is based on a sort of 'social formalization' in which rules and guidelines are adopted as a way to regulate the role of actors.

Although the Board clearly serves as a boundary organization due to how they serve as a link between different actors of society and coordinate the interaction between experts and laypeople, one could argue that it has a different approach than the latest used by the IPCC. This can be seen not only because the Board seems to be much more open to public opinion, but also by how a variety of valuations formed by different technical perspectives are all set on an equal basis in its policy proposal. Furthermore, long from having a clear social formalization approach, the Board seems to be more flexible with the role that each actor has and more caution with the technical expertise from scientific authority. At the end, this is possible precisely because the Board's policy proposal uses the notion of 'nature' as a centre for negotiation on how to categorize GMOs. This seems to be strategic in political terms as it allows flexibility for achieving less controversy among valuations acknowledging different perspectives.

Interestingly, the comparison of GMOs to 'nature' may not only be a way to acknowledge different public concerns and diverse visions of the common good, but also allow different actors to become more proactive as they are forced to think more than just being precautious. There is a new proactivity that can be seen by how the documents use their political language. This seems to be a direct sign that there is a turn towards becoming more anticipative, besides being inclusive and providing a new way of being responsive. This is important to consider in regards to RRI, as anticipation, inclusion and responsiveness are three of the four RRI premises. The four premise, reflectivity, can be addressed by addressing the need of actors to understand the consequences of the political subjectivity of using 'nature' as a basis for regulation. All actors need to be reflective over the possible limitations about using 'nature' as a basis for categorizing risks and benefits of GMOs, as it may obstruct the effective responsiveness that authorities may need when approving and adopting GMOs in Norway.

In conclusion, recognizing the political dimensions of technological issues is important given that the notion of RRI is based on the basic idea that science and technology are not only technical but also socially constructed (Winner 1977). The use of political language such as with the term 'nature' provides an opportunity to be proactive as to address potential risks and benefits. This is because it allows to take into consideration different type of valuations and because such type of terms help building desired future pathways (Beck y Mahony 2017). Meaning that recognizing how 'nature' is being politically accounted helps to create a more proactive projection of potential impacts, which in other words implies being more anticipative.

6.2 RRI and the assessment of risks

Despite the many differences among the valuations done by the analysed documents, we have seen in the previous chapter that they all have a preventive approach towards potential impacts. Meaning that the valuations are based on an anticipatory perspective towards the assessment of risk. This turn towards an anticipatory vision of risks may be a consequence of the terms under which the Board launched the open consultation and the subsequent request for policy letters. As addressed by a participant in an open debate meeting in Oslo[3], the underlying question that the Board asked for the consultation was not if 'GMOs should be allowed or not', but 'how they should be allowed in the future'. Meaning that from the very start, the Board set the

[3] Open meeting in the Literature House Oslo December 2018 organized by Bioteknologirådet

discussion on the light of not only having to be cautious, but actually on the need to be anticipatory, as the release of GMOs is not set just as a possibility, but seen as imminent.

Interestingly, the Board's policy proposal reflects on this move towards the anticipation of risks by taking into account all different type of risk valuations in the documents. This is done despite that many of the acknowledged valuations are contradictive to each other, either because of how specific risks should be attended or because how certain risks are originated. Meaning that the Boards policy proposal once again seems to be inclusive towards diverse type of valuations. However, in this effort for being inclusive the Boards policy proposal indirectly ignores an important element despite that it is mentioned in several documents. Which is that the risk regulation of GMOs should be done by the same regulatory premises than other technologies. This claim is present both along documents focused on making valuations for deregulating GMOs, but also among some of those aiming to maintain the current regulating system. It can be seen in Figure 3 where there are many documents, about one third, located in the higher section of the green line (G.3). The importance of this claim is that other substitute technologies may have a higher risk than GMOs (as it will be later explained), and thus only restricting the use of GMOs may increase the final risk that it is to be taken.

Thus, although risk assessments of GMOs are taken into account in comparison with the risks of other technologies in the Board's proposed policy, the problem is that the regulation focuses only on GMOs and not on regulating other technologies. This is of course because the law is only about GMOs and not about other technologies. Which means that other technologies do need to undergo through the same regulatory process than GMOs. The approval process for other technologies is easier, cheaper, shorter, and attracts little attention from both the public and authorities. This incongruity is not only due to how the Board's policy proposal is written, or due to the terms under which the consultation for re-regulating GMOs was launched, but mainly because of the structural conditions over which the proposed law was established. The regulation of genetic engineering in Norway has a long history in which GMOs have been seen separately from other technologies, especially in regards to risk assessment (Ullestad 2016). The establishment of open debates during the 1990s were set in light to only assessing GMOs and not consider other technologies (Heggdal, 2016).

This establishment of political pathways on laws defining how to address issues related to science and technologies has been studied in Norway. Asdal (2011) explains that Norwegian environmental policy was shaped by specific institutional practices staged in the post-war area

where high industrialization interests were at play. The regulations for environmental pollution in Norway were set on the basis of their impact on industrial development and thus framed by the concerns of economic risks of limiting industrial production. Moreover, the calculation of risks were based on comparing different industrial procedures, not on other type of modes of production outside the industrial model. Consequently, non-economic risks forged by other type of modes of production, such as agriculture or tourism, were not even mentioned. The law for environmental regulation focused exclusively on the terms of regulating industrial pollution. This sort of policy development has parallel features to the regulation of GMOs in Norway.

The terms over which the regulation of GMOs are defined today, are established under a model exclusively based on addressing the risks of one type of model, which in this case is the aim of producing GM-free food in Norway (Heggdal, 2016). As addressed by many of the studied valuations, most of the documents aiming to maintain strict regulations on GMOs do so because of the economic interests they have in the market. They wish to maintain an image of Norwegian food as clean from the use of controversial technologies. It is a way to compete with farmers from other countries who produce at lower costs because of their use of GMOs. Furthermore, having the same type of regulations for all other technologies that change genes, would be counterproductive given the significant costs and paper works that it would imply. However, there is an urgent misbalance when it comes to GMOs as regulations are not equal.

Taken into consideration the risks of other technologies while defining risks of GMOs is imperative if the anticipatory perspective over risks is really going to be responsive. Davison and Ammann (2017) state that any attempt for anticipating risks caused by manipulating genes must be done by studying all technologies available technologies within genetic engineering. This is because scientists using technologies such as mutagenesis or triploidisation have little oversight over all genetic changes being done and cannot define with high probability what the final effects will be (Maghari y Ardekani 2011). While with the use of GMOs this range of uncertainty is must smaller. The recommended methodology to assess risks of different type of technologies is known within innovation studies as a ‘cross technological assessment’ (Lele 2012). This approach allows to schematize the probability of risks along different scenarios and define best possible alternatives by using alternative technologies.

In the case of crop production, comparing GM crops with conventional crops has shown to be essential as to understand the dimension of the final risks to be undertaken (Oliver 2014). This idea is implied in some of the previously analysed valuations, but not explicitly explained. For

instance, when some documents stress the fact that the production of GM herbicide tolerant crops demands the use of large amounts of chemicals, they do it in reference to the crop itself. Meaning that they do not compare the amount of chemicals used with what would have been needed if the same crop would have been produced under the same conditions. This is the same with the idea (also implied along some of the analysed valuations) that the use of chemicals on GM crops increases over time. GM herbicide tolerant crops do use large amounts of chemicals (they are designed for it), and in many cases they do demand larger amount of chemicals over time (especially if instructions are not followed), but their impact is much lower if compared with conventional crops. The most important meta-study about chemical use and GMOs, which analysed 147 studies and was published by Klümper y Qaim (2014) concludes that GM crops have reduced chemical pesticide by 37%. At the very end, the importance of this is that most of the farmers who use GM crops do it not because they what to produce exclusively GM crops, but because they want to produce crops with the best available technology for producing crops. Consequently, banning GM crops as a measure to diminish chemical toxicity, usually encourages more toxicity. This is essential for Norwegian legislators to understand, as per today Norway buys non-GM crops for the fish industry in an effort to lower the use of toxicants in developing countries (Lundeberg and Grønlund, 2017). The real effects of this policy are the opposite as this type of policies have the opposite result (Sánchez y Parrott 2017).

The case of GM crops is illustrative not only because it is present within several of the studied valuations and because it shows the importance that comparing risks cross other technologies, but also because it helps to identify the benefits that GMOs may have over other technologies. Oliver (2014) explains that the real reason for adopting GMOs both in crop production and the health industry is not only because it implies taking lower risks, but mainly because of the benefits they imply when compared with other technologies. For instance, (Mahaffey, Taheripour, y Tyner 2016) shows that if GMOs were banned, there would be about 14% increase of emissions worldwide. This is because the use of GM crops give farmers the opportunity to stop plowing the soil, which is one of the main activities that releases large amounts of emissions in agriculture. Likewise, the University of Gottingen published a comprehensive analysis of many studies assessing the potential benefits of several different kind of technologies for manipulating genes. Their conclusion states GMOs had increase crop yield by 22% and increasing farmer profits by 68% when compared with conventional technologies. This results aligned with a report published by the Belgian Research Institute VIB (2016) which also is a meta-study comparing several technologies. Consequently, a law that

focuses on overregulating one technology does not only fail to define final risks, but may also oversee important benefits. Additionally, overregulating a technology may actually have further implications on aspects regarding the responsiveness that a country may have at other scales.

Tagliabue (2016) explains that the capacity of responsiveness of actors aiming to avoid risks from GMOs can be even more limited in countries where GMOs are banned or overregulated. This is because overregulation obligates authorities to use large amounts of money and institutional capacity to control GMO presence. In countries where the only demand is to report the use of a GMO, companies are obligated to give information of where and how the GMO is used in their product. Given that there are no restrictions, it is assumed that the companies do not hide information. Thus, there is an open flow of information about the GMOs being used along with a clear description of their probable risks. This enables authorities to have a real control of GMOs in the internal market. It is otherwise very difficult and costly to detect GMOs if there is no open information provided by the producer or provider. This means that paradoxically, countries with lower regulations of GMOs have a better and more realistic control on the risks of GMOs than countries with strict regulations or bans. As a result, it can be assumed that countries with lower regulations on GMOs have potentially a better capacity of response in case unwanted impacts of GMOs are detected (Purdue University 2016).

In conclusion the preventive approach towards potential impacts seems to be anticipative and inclusive. These two RRI premises can be found in the Board's policy proposal. However, the Board makes no reference to the need of regulating GMOs equally as other technologies, despite that this is mentioned along several of the studied documents. This is important because it is a call for reflectivity done along many valuations, as other substitute technologies may have a higher risk than GMOs. Consequently, restricting only GMOs may increase the final risk that any actor may undertake when having to use a technology that changes the genome. Besides, acknowledging other technologies is also helpful for defining potential benefits. This has shown to be vital within agricultural practices. Likewise, having equal regulations is also important because it may avoid overregulating one technology. Overregulation of GMOs may result in limiting the responsive capacity of authorities to control unwanted impacts of GMOs.

6.3 RRI and the public's new role

An element that stands out when taking into consideration the valuations done along the different analyzed issues is that they all are centered on assuming that the public has a key role. The public, or better said, the different publics represented by the different type of documents, are written in a way that they assume a role which one can notice that they expect to be heard. They are engaged and seem to be open on the different aspects about the regulation, and sometimes offensive on the values, background criteria and the type of principles to be used. This is already seen in the very basis of how the open consultation was launched by the Board. The public call for inviting actors from all sorts of institutions and individuals to send their policy letters is designed in a way that creates this attitude. There is an expectation in which the public should not only be a watchdog of the technology, but be set in the forefront of it.

As stated by Patel (2009) this kind of behavior of the public is an inclusive tendency seen in several western countries in which the public has been empowered within political terms. Despite that there are many researchers denouncing a current tendency in which there is more self-censorship among the public (Lynn-Ee Ho 2008), the public seems to also have become more self-secure of its role in society. This development could be a consequence of the maturity of democratic systems, but Morita et al. (2013) explain that this is most likely because of the public has become more aware of expert uncertainty and critical to expert judgment. Furthermore, Burstein (2003) states that it can also be a consequence of how today's economic system has become more dependent on public opinion. Governments and private initiatives are more dependent to the public because of how customer and producer relations have developed. A dependence that some researchers as Mustalahti (2018) say that it will most likely be reinforced as the bioeconomy develops over time and the public gains more legitimacy.

This new role of the public seems to be a result of a reflexive process along diverse actors both among experts and non-experts (private and public) in an effort for recognizing the need to use new technologies for confronting today's gran socio-environmental challenges (Mustalahti 2018). This is an especially strong movement in the European Union and is partially the force back the fomentation of RRI within Europe. The public, although not clearly defined, is set as a major actor in the definition and development of scientific research. It is set at the forefront of the technology precisely because it is a way to recognize the problems affecting of our reality. However, although this represents a very positive development within the terms of democratization, it also means having to consider some specific problematic issues. The main

problem is the disparity between expert opinions and the different valuations that the various type of publics make. This is important to acknowledge because the public may be the most powerful force within society for performing change, but their real impact is dependent to the information that motivates, supports and justifies their public engagement. Thus, if wrongly informed, Woodhouse et al. (2002) explain that the public can be very destructive although there is a human tendency to believe that at the end the public will always have the moral truth.

Despite that it is not possible to group the different type of valuations that diverse type of lay publics make on the analysed issue of deregulating GMOs, there are some common elements which can be mentioned. The most important one is concerning the uncertainty about the safety of GMOs. It is not only that most of the documents written by non-experts mention different degree of uncertainty towards GMO safety, but also the fact that most of consumers in Norway are sceptical towards GMOs (Hofverberg 2014). Interestingly, it would seem that this general scepticism is not based on technical issues, but on how the industry back the technology is perceived. Meaning that the uncertainty in rather ethical than technical. There seems to be an assumption that GMOs should be seen with suspicious eyes because their development is not mainly for creating something good for the public good, but for making money. Either because of how the industry may be buying or pressuring researchers to produce fixed results, or because the industry uses its muscles to avoid competition, or because it obliges users to use their product, the public has a resistance towards the industry. This is important to consider if the creation of the future bioeconomy in Norway is thought to be based on industrial actors.

What is interesting is that expert knowledge on GMO safety is overwhelmingly positive. A thorough literature review of the most recognized scientific papers published about GMO safety, shows that there is clear, abundant and consistent information about this issue. To begin with, the World Health Organization and the *Britain's Journal of the Royal Society of Medicine* state separately that "No effects on human health have been shown as a result of the consumption of GM foods by the general population in the countries where they have been approved" (Specter 2013). Throughout the past thirty years there have been more than 2,000 per reviewed scientific studies evaluating the effects of GMOs on aspects about health and the environment, and the vast majority finds that there is no heath treat what so ever. The consensus among scientist, about 95% of the international scientific community, is that GMOs offer no more risks than those developed through conventional breeding techniques (Landrum, Hallman, y Jamieson 2019; Nicolia et al. 2014). Complementary to this, Noreno (2017) shows that there

have been more than 284 independent scientific organizations from all over the world which have concluded that GMOs pose no unique health risk. As if this was not enough, more than 110 Nobel prize winners issued a joint statement in 2012 that concluded: "Scientific and regulatory agencies around the world have repeatedly and consistently found crops and foods improved through biotechnology to be safe as, if not safer…" (Pacher-Zavisin 2016, p1). Ironically, most of these researchers and research institutions are not located in countries with low regulations on GMOs, but in Europe, the continent that has established more obstacles to GMOs while being the largest importer of GMOs in the world (Tagliabue 2016).

There is no doubt that science can construct its own path and blind itself, and that the public should never followed uncritically what an expert community says. Advancements of science and technology can paradoxically create pathways of thought that ignore or oversee knowledge (Callon et al., Barthe 2009). It can be dangerous given that such pathways of thought produce a "continued movement towards a greater and greater level of attachments of things and people at an ever expanding scale and at an ever increasing degree of intimacy (Latour 2007, p4)" and can therefore lead to construct false premises. Which in other words means that science and technology can end up carving their way into regrettable situations very difficult to overturn. Besides, experts have a tendency to be comfortable with the lineal model explained by Beck (2011), in which it influences how they see everything, limiting other non-scientific knowledge which could have helped foresee hidden risks (Wynne 1992). Jensen et al. (2008) explain that the public has become more sceptical towards scientists because today's technologies have implications that are far more complex than what can be understood through scientific thought. This is in essence what creates mistrust on the public, and can be clearly seen along several valuations done along the analysed documents when addressing GMO safety.

The most important collective effort that has challenged the scientific consensus over GMO safety was published by Hilbeck et al. (2015) and signed by 300 independent researches, stating that such consensus is an artificial construct. They argue that claims for consensus is not supported by an objective analysis of refereed literature. The main argument is that GMOs can unintentionally introduce additional fragments of genes in ways which could alter an organism's DNA. Additionally, such new genes may create chemical unbalances that could disable organism function normally (Cotter, 2014). Furthermore, the study by Catacora-Vargas et al. (2018), which was based on analysing 410 scientific articles, explains that it is not only GMO safety that one should worry about, but also their socio economic impact. They

summarize their results as follows: "(i) there is limited empirical research on scientific literature; (ii) most research is limited on monetary economic parameters; (iii) there are very few empirical studies on social and non-monetary economic aspects; (iv) most of the research reports only short-term findings; (v) there are high methodological mismatches; (vi) conventional agriculture is the commonly used comparator, with minimal consideration of other agricultural systems; and (vii) there is the overall tendency to frame the research upon not validated theoretical assumptions, and to over-extrapolate small-scale and short-term specific results to generalized conclusions" (Catacora-Vargas et al. 2018, p.1).

Although important to acknowledge the high value of studies criticizing the general consensus of GMO safety and benefits, it is important to recognize that they are an exception (Katiraee, 2019). Within scientific literature there are very few studies denouncing direct negative consequences of GMOs (Sánchez and Parrott, 2017). This is interesting in the light that most popular media outlets provide the opposite view. Any person trying to obtain information from common popular media on the internet will most likely find anti-GMO statements. What it is important to see is that most of the studies having a direct critical view on GMOs are done by independent researchers, almost always based in NGOs (Paarlberg 2014). Interestingly, almost none recognized and independent scientific or health institutions in the world has expressed unique concern with GMOs (Maghari y Ardekani 2011). Actually, the Centre for Biosafety - GenØk is one of the few research institutions that has published critical research on GMOs (Heggdal and Langberg 2016). However, GenØk is seen as a political-active driven organization rather than an organization that is based on independent research (Ullestad 2016).

In any case, how should the authority of science be understood? Does science really have any especial authority, or should it be seen just as an opinion equal to other type of knowledge? Science, based on Merton's norms, is a process of right behaviour that accounts for the principles of universalism, communism, disinteresness, and organized scepticism (Kim and Kim 2018). It is a complex social, collective and organized response to the questions done to take a conscious action and foresee the lacunas of knowledge over which important risks maybe taken (Beck 2000). Science is the accumulation of high quality of information that is causal, impartial, symmetrical, and reflexive. It is the result of immersing oneself into all available data and identifying the week arguments from the strong in a constant process of measurement (Felt and Fochler, 2013). Thus, science does have a special authority that needs to be recognized.

STS is seen by many as a discipline that is thought to criticize any type of consensus reached within science. This is because many well established STS researchers have done important work about the need to value and acknowledge other types of knowledge, and have shown that science is a coproduction procedure between social and technical criteria. Moreover, STS scholars also argue that well established scientific consensuses change over time, following what (Kuhn 1970) calls as 'scientific revolutions', when one paradigm is transformed to another as new ideas and discoveries are developed. Nevertheless, the real and most important contribution that STS can offer is precisely to understand the value of science. Not because scientific thought should be considered as the real truth, but because it should be seen as an acknowledgment of the existence of a real world. Actually, the truth value of scientific knowledge is not necessarily at stake in STS research, but what is important is to focus on how scientific knowledge is used in practice (de Laet, 2012). Some critics interpret Latour and Woolgar (1986) as if with their asseveration that 'facts are co-constructed' they had aimed to categorize science as a simple subjectivity, but their work is all about the opposite. What they actually did was to reinforce the authority of scientific work by reflecting the unique sociotechnical process through which scientist made. The fact making industry, made through the use of technical devices and the production of texts, is a process that forms itself by a unique methodology that is critic and based in consequently readdressing itself. Consequently, although all scientific consensuses may be transformed at the end of the day, scientific consensuses have a special authority that needs to be properly recognized.

There is of course a tendency along scientific research communities to disregard public opinion that is contrary to the establishment of scientific consensus. STS scholars has done very good work denouncing this by not only reaffirming the importance of other type of knowledge, but also showing the murky social factors back scientific knowledge. The case of GMO is not different, as Wynne (2007) explains on how scientific clubs reject as nonsense or over drama hysteria, to all attempt of public skepticism towards GMOs. However, Wynne also explains that rejecting misunderstandings is not only that, but it is to misunderstand-misunderstandings. The critical view of lay-people needs to be taken seriously, not only as knowledge in its self, but to position it on a high standard. This needs to be done even if such knowledge does not align or directly contradict scientific proven facts. This critically important not only because of ethical reasons, but because it can help understand the 'knowledge knots' that are needed to be fixed for building good science. Either because it pinpoints where science communication is failing, or because how the model for research goals is misguided, or because of ethical

perspectives that researchers cannot see, or because there are simple other systemic mistakes that only public opinion can provide enough quality information for identifying them.

Interestingly, the Board's policy proposal seems to have tried to value the public's opinion in a quite literal way. Although the proposed law does take into consideration basic scientific criteria that is portrayed along the valuations done by expert led policy letters, it is not scientific in its core. It mainly takes into consideration most of the valuations that contradict the scientific consensus on GMO safety that are stated along the various documents written by laypeople. This effort for taking a hand in both sides of the polemic issue of GMO safety is done without mentioning the scientific consensus or any direct assertion against GMO safety. The entire proposal maintains certain neutrality, but still makes notice of the two positions in a clear way without setting them as two contradictory oppositions. This is partially achieved by the categorizing system of potential risks and benefits that allows several possible ways of dealing with GMOs. In addition, the inclusion of assessment criteria such as sustainability, social utility and ethics also allows the needed flexibility in the law to address different type of valuations. This shows that the Board's policy proposal is doing an effort for proposing an inclusive law.

In conclusion, the Board has been capable to include different type of valuations, which illustrates that the public is perceived as having a new role. However, one must not forget to acknowledge that such inclusive and anticipatory way of dealing with different type of valuations may be problematic. Scientific knowledge and public knowledge need to be taken seriously and acknowledged in a proper way so that they can complement each other. The Board seems to have been able to do this as it has been able to create a law which does address different and even contrasting perspectives. This has been done by having an approach that is not only anticipatory, but also inclusive, reflective and aiming to be responsive in an effective way.

7 Conclusion

The analysis of valuations done by documents addressing the deregulation of GMOs in Norway has been illustrative to understand how the turn towards the 'good economy' is being realized. This is because this material provides a unique opportunity to study diverse public concerns and visions of the common good about the Norwegian endeavor towards the 'good economy'. The effort of using the RRI framework to interpret the valuations done by these documents has been useful for having a unique analytical focus on how the 'good economy' is being realized. It is through this interpretation that I have been able to define three key findings that are based on the three different issues identified along the valuations enacted by the studied documents.

One first finding is that there is reason to believe that current regulatory frameworks in Norway are addressing or recognizing the public with a new role. The studied case on GMOs shows that there is an effort for considering the public as a diverse entity that does have an important agency, and that it is capable to endorse its role in a more proactive mode. This public proactivity has clear signs of being anticipatory. This seems to be a result of the effort that Norwegian authorities are making for acknowledging the public's opinion and establish it within proper frameworks. Instead of disregarding the technical misunderstandings of the public, Norwegian authorities seem to acknowledge them and set them as part of the new law.

A second finding is that the effort for transforming current regulatory frameworks in Norway are becoming more anticipatory on assessing potential risks and benefits of new technologies. However, this effort is being built by valuations that center exclusively on one type of technology, and not by considering valuations that compare different types of technologies. This seems to be leading to a situation in which each technology ends having its own regulation, meaning that there are no cross-cutting regulations along potential substituting technologies. This may be problematic as anticipating potential risks and benefits of new technologies can be done better when different technologies are regulated equally. Besides, overregulating one technology may obstruct the capacity of authorities to be responsive over negative impacts.

A third finding is that the case of deregulating GMOs shows that regulatory frameworks aiming to forge the 'good economy' are being built by using subjective terms rather than technical. This is done despite that there are clear attempts for addressing this issue on a scientific basis. In the studied case of deregulating GMOs, such logic is centered on the notion of 'what is more natural'. This might have several advantages as for inclusion of different type of publics and

the possibility to create dialogue among opposing interests, but it may also be problematic. Several technical valuations claim that using 'nature' as a basis for categorization may lead to misleading outcomes for effectively addressing potential risks or benefits given that it is a term that can be used to categorize in many different ways and may cause conflictive interpretations.

Comparing GMOs to nature may have disadvantages, but it is an interesting way to not only acknowledge different public concerns and diverse visions of the common good. It may also help to address potential risks and benefits of GMOs with a more 'preventive fact based attitude' instead of being speculative as it has been until now with the current law. This is precisely what the identified turn towards a more anticipatory approach may imply. Using 'nature' as a guide in a more anticipative way can help actors following the law become more reflective and thus better aware about the real effects of using GMOs. Which in turn may help focus on what we really now about GMOs instead of only focusing on what we don't know. This perspective, besides being more inclusive and reflective, provides a better chance for being responsive, which in other words helps to address the four guiding practices established by RRI.

These findings show that the realization of the 'good economy' seems to being built by transforming regulations on the basis of key premises such as anticipation and inclusion. Nevertheless, the capacity for responding effectively towards potential risks and benefits of new technologies will depend on the guiding parameters of specific terms, and if new technologies are regulated by equal criteria than the used for other substituting technologies. In regards to the addressed study case, the use of 'nature' as a guide for categorizing GMOs may be useful for making a law that is more anticipative on identifying potential risks and/or benefits. Moreover, the use of 'nature' may also be helpful to stress the fact that GMOs should have equal regulations than other substituting technologies which also change the genome.

How '*good GMOs*' are in the Norwegian endeavor towards the 'good economy' will depend not only on recognizing the anticipatory and inclusive turn of Norwegian regulatory frameworks, but also on their degree for being reflective and responsive with new technologies.

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As a final note, I would like to make notice that these three findings are visibly related to the use of the three criteria defined in the methodology of the study. First, as one may see, each finding is directly associated with each one of the three issues identified in the analyzed valuations. Second, the identification of these three type of valuations are based on the three criteria defined in the methodology. Consequently, in accordance to Schmidt (1957) whom states that any method may condition the final results of a study, I make notice that the three findings defined in this thesis may be conditioned by the criteria I used in the method. It is therefore important to provide some critical ideas about how the study could have been different if another criteria had been chosen despite using the same material and theoretical frameworks.

A first idea is that it could have been interesting to analyze the network relations that the documents build while making their valuations. This would have helped to understand how different type of documents are linked to specific conglomerates of organizations along specific lines of ideologies. Such focus could have possibly helped explain why certain research or political organizations have a tendency to address potential benefits and risks in specific ways. A second idea is that I could have used the four premises of RRI as the four methodological criteria used for identifying valuations in the documents. This could have been useful for being even more explicit on how the relation between RRI and the empirical material can be done.

Finally, it would have also been interesting to focus on emotional expressions identified within the studied valuations. Meaning how the documents express specific affections on the basis of their writing style and modes of addressing issues. In some documents I found this to be very strongly perceptible. Some documents made powerful ethical valuations by using words aiming to express fear for GMOs, while in others emphatically aimed to make readers feel hopeful. Such analysis would have most likely led to interesting ethical discussions about how the Norwegian ‘good economy’ can also be found in the hearts and minds of the Norwegian people.

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Appendix

The following chart is a summary of the analysis I did of the valuation on each document. It provides a short description of what I found for each criteria in each document. In addition, I provide a number for 'X' and 'Y' between 1 and 9 to define the degree described in each criteria. This is of course done by my own interpretation and subject to the methodology I used for conducting the analysis. My intention is to not have a quantitative analysis of the documents.1 In addition, I do not provide the names of the people who write the private policy letters, but name them by number. This is because of consideration to the current regulations from the 'Data Protection Services' in Norway (Personverntjenester NSD).

Name of organization	**Criteria 1:** ***'the type of language'*** X= degree of scientific language Y= degree of political language			**Criteria 2:** ***'the type of strategy'*** X= willingness to deregulate current law Y= willingness to regulate other tech.			**Criteria 3:** ***'the type of actors'*** X= degree of focus on the public Y= degree of focus on the industry		
		X	**Y**		**X**	**Y**		**X**	**Y**
Nettverk for GMO-fri mat og fôr	It is contra productive to have a complex law, the real strategy should be to change the subsidiary technical documents and based all criteria in the Precautionary Principle	3.3	7.6	Norway's availability to restrict GMOs from EU is seen as a central value both within a business perspective but also scientific. It is critical to define the relation with EU	2	2	The large group of actors who they represent and their direct and always standing meaning: anti-GMO. The law should be based on social values of Norwegian people	8	2

NTNU Vitenskapsmuseet Institutt for naturhistorie	Forms an authority around its expertise and specific knowledge about evolutionary biology	9	5.6	Direct critic to the very basic criteria for holding the changes in the law	1	9	Based on their knowledge of critical issues based on science and expertise	7	8
Universitet i Oslo	Strong writing style that portraits expertise and strong meanings, creating a sense of dominance of the topic.	8.9	6.6	The proposed changes are positive seen, but have many grey zones and contradictions which need to be defined	9	9	Define actors based on their deep understanding of the contradictions and difficulties in what the law itself proposes	8	6
Institutt for Biovitenskap (BIO), Universitetet i Bergen	They present themselves as the biggest research environment for biological research and one of the most interested in the topic	9	8.1	GMOs need to be allowed in Norway for confronting development challenges	8,7	7,8	Based on their scientific knowhow and understanding of the challenges our society faces	7	7
Uni Research Miljø	Their innovative role in use of GMOs and their scientific background	6.2	6.1	Forge a regulation that can allow different levels of uncertainty, but also support technological entrepreneurship	8.7	5	Based on their scientific knowledge, understanding of public concerns and the need to support new developing paths for technology	5	8

Tekna	Provides a very detailed understanding of the positive and negative sides of the debate, making an impression of being well informed	5.6	6.5	The importance of embracing the positive elements of the technology and correct the current limitations without losing a reasonable balance	7.8	5	It does not give a direct reflection of actors, but give an idea of being co-productive	4	7
Statens-Legemiddelverk	They address the big importance of GMOs on medical treatment and thus their interest and knowledge about the issue	8.7	6.7	There are key positive elements with GMOs which are being limited because of the criteria in current law. It is therefore important to change to a more modern alternative	9	6	Their capacity to compete with high technology in a constant developing and competitive arena	7	8
Norsk Bonde- og Småbrukarlag (NBS)	They address the bad experiences that international colleagues have had for small producers	4.3	7.6	Their capacity to secure food production though traditional safe methods in which new technologies can be accepted but need to guarantee safety	2	1	GMOs are the result of an economic model that Norway does not need and should not be part of, especially because it is led by a negative culture of profit	8	3
Sjømat Norge	Its large representativeness for all seafood industry in Norway, its direct research and probable	7.1	5.5	The positive view of use of GMOs in small controlled	4	2	Their capacity to use what is needed as long as the	4	7

	use of GMO, and its long standing arguments			issues, but not on large inter species production			changes are not too big and out of control		
Ryggvoll Melkeproduksjon	A direct strong statement that aims to not allow any other way of thinking but to stop GMOs	1.3	8.1	GMOs should be seen as unwanted technology with no room in Norway	1	1	By addressing studies of great danger and uncertainty with the use of GMOs	6	1
Oikos	Builds up an image on ethical concerns regarding ecology values, health, justice and caution and its representativeness of groups following ecological viewpoints	3.4	7.6	GMOs are seen as an antithesis to ecological production which needs to be maintained	1.5	1	Their capacity to maintain an identity free from GMOs and use of traditional ecological production	8	1
Norsk Landbrukssamvirke	Creates authority by naming their representatives among local farmers and land users	6.5	6.5	The urgent need to develop knowhow about GMOs within the best quality of scientific and political information	7.8	5.6	Is based on the information they receive through open democratic processes	7	2
Norsk Industri	They name their specific role as representing industrial actors in Norway	6.7	7.1	A law that is allows to compete and does not serve as an obstacle	8.9	3	Is based on their capacity to compete internationally	6	9
Norsk-Gartnerforbund	Their experience on the specific flower and plant market and the	7.5	5.5	Scientific and well informed from international actors and interests	8.8	5.2	Their technological involvement with the specific business and their	6	6

	critical use of technology in their business						understanding of benefits over the risks		
Norges Bygdekvinnelag NBK	By representing the public's political and basic right interests	5.4	7.5	Most lay people in Norway are skeptic to GMOs, which why one should follow all public's interest	4	1	Based on the understanding of what consumers think and feel regardless to the technical issues	6	5
Norges Bondelag	Their experience with producing food without the use of GMOs	3.5	8.8	The main problem is that a new regulating system will create confusion especially due to the lack of experience	3	1	The type of experience that actors have both with non-production (or lack of experience with GMOs) or bureaucratic process	8	2
Nofima	Scientific background with rename in Norway	8.6	7.6	By addressing the need for not taken unnecessary risk	5	1	Their understanding of the Precautionary Principle and the unknown consequences	5	8
Norges miljø- og biovitenskapelige universitet Fakultet for Biovitenskap	Their scientific background and clear understanding of political and economic consequences	9	8.8	Need to support real market needs aiming for less restrictions, better informed public and	9	7.5	Based on their understanding of the details of what their arguments state, what is GMO, conventional, natural, etc.	7	7

NHO Mat og Drikke	The large group of companies they represent (1600) within central function in this topic	6.6	6.9	The need to support international business competition capability of Norwegian companies	8	4	Their capability to provide real innovative solutions and the creation of value	7.6	7.4
Natur og Ungdom	By basing all their arguments on the Precautionary Principle	2.1	8.5	Today's law is already flexible enough for modern GMOs so that there is no need for change, just the need for analysis case by case	2.3	2.1	On their real interest for protecting nature and not economic needs	9	1.1
Legemiddelindustrien (LMI)	Their position as representatives of large private Norwegian companies within the medicine industry	7.6	6.4	The law is outdated and there is a need for facilitating investment on the subject	8.5	3	Based on their capacity to define the effects and not the methods used while using GMOs	7	7.7
Bondens marked Norge (BmN)	Is created by their legitimacy of representing consumers and farmers	3.4	7.7	The competitive characteristic of farmers food in Norway may be lost with the introduction of GMOs	1,6	1	Is based on their moral consciousness about understanding that GMOs are a risk to ecosystem	8.7	1.1
Kirkerådet	Their authority is based on addressing clear and strong human values for society and nature	1.1	8.8	Is formed by addressing Norway's leaders' role in ethical regulation of technology. Being	4	1	Their long history of engagement with the topic of patents and human and	9	1

				proud for being stricter than others.			nature rights, and the openness of a system.		
Heidner-Biocluster	Define their authority in regards to their role as leader in the local food business market	6.6	5.4	There is a need for being more competitive and use of best technology	8.7	4.3	Is based on their involvement with the national market and moral consequence	6.6	5.5
Havforskningsinstituttet	The underline their role in research and development and commitment to Norwegian interest	7.4	7.4	There is a need for making autocratic procedures easier	8.2	3	Actors are defined by their knowledge within scientific research and practice issues	6.5	7.6
Graminor AS	Builds its authority on their social function as seed developer for the local and international market, and in their investments on research and technological know-how	7.6	7.8	Provides a unique opportunity to develop safe seeds in cheaper and more competitive way	8.9	2.1	Their ability to understand the importance of using high technology and scientific standard criteria	7.6	8.7
German Federal Office of Consumer Protection	Based on their scientific expertise and national authority (German)	8.8	2	Scientific and non-political	6	9	Based on the logic of what risk is and what the change done in the genome is	5	5

and Food Safety									
Geno, Norsvin and AquaGen	They position themselves as key actors within national and international food chain market	6.7	6.8	Is based on promoting the capability to compete in the international market with high quality product	8	4	Is based on their ability to provide jobs and services to the community of high quality	6.8	7.7
De nasjonale forskningsetiske komite for naturvitenskap og teknologi NENT	Their authority is based on their institutional expertise in ethics and biological and environmental issues	3.4	7.6	The issue is seen within the uncertainty and the limitations of GMOs	3	2	Is based on how seriously and close they take the Precautionary Principle in their work	9	1.3
ACD Pharma	They focus on their industrial competence and on the need to have biological logic in the criteria, not moral values which can be subjective	6.6	6.3	Pinpoint the need for less uncertainty in the regulation framework	7	3	Is based on their direct approach to scientific legitimation and understanding of biological processes	5.9	9
Benchmark Genetics	Their authority is based on their experience and knowledge about international market	5.5	5.6	The problem should be on addressing the final product, not	8	2	Is created by their capacity to empower the market with	5.6	8.8

				the process. Also there should be a way to make thing quicker			positive moral and economic insights		
GenØk	Is based on their positioning as a national institute that specializes on the topic.	7.8	7.8	Their approach is based on speculation and framing uncertainty	3	8	Criticizes the scientific status of GMOs.	6.6	5.5
Landbruksdirektoratet	No text			No text			No text	7.8	2.1
Naturvernforbundet	By basing all their arguments on the Precautionary Principle	4.1	6.7	Today's law is already flexible enough for modern GMOs so that there is no need for change, just the need for analysis case by case	2.5	2.1	On their real interest for protecting nature and not economic needs	8.8	1
Policy letter private person 1	Presents a balanced, well informed and ethical perspective of GMOs as a starting point for debate. The author explains well the context and contrasting elements	5.5	6.4	There is a need of a law that is able to have little contradictions and thus more explicit explanations of what means what	6	3	Determined at a balanced analysis of co-production along social and technological arguments	7.7	5.5
Policy letter private person 2	Very authoritative document due to the large number of scientific authors (NIBIO, NMBU	9	8.8	GMOs need to be treated in the same way as other technologies	9	8.6	Co-productive, articulating arguments in a balanced way	8.7	7.7

	og UiO) and its clear understanding of the problem			and their positive potential needs to be supported			to understand the technology and social factors		
Policy letter private person 3	Well written argumentations against GMOs within political viewpoint, not technical or scientific	4.5	5	GMOs are not needed and embody a political pro capitalistic force that needs to be confronted with ecological techniques	1	1	Highly technological deterministic with large accusations of the technology embodied political means	8.7	7.7
Policy letter private person 4	Well informed about the specific issues that are on debate in the law, use of good examples and needed explanation	7.6	6	Focus on the need to developed in regards to the type of problems addressed today	7	9	Midway deterministic, call for understanding the technology itself	8.8	6.6
Policy letter private person 5	Direct critic to the anti-GMO argumentation by providing logic stand points	3	7	There is an urgent need to support the use of GMOs in Norway due to its potential positive effects	9	6	Highly technological deterministic as sees GMOs as main source of problematic issues and risks due to interests behind it	8.8	7.6
Policy letter private person 6	Little authoritative, but with specific concerns typical among lay people	1	5	Supporting the need to understand the positive effects of the technology, but also taking into consideration the negative effects of it	5	1	Co-production and balanced definition of the technology	8.7	1.1

Policy letter private person 7	Presents himself as a concern individual by giving personal information and making basic questions of security and negative consequences	1	3.3	Genetic technology is by definition dangerous and with unknown effects that need to be taken seriously	1	1,1	Highly technological deterministic accusing the technology of embodying political will	8.8	1.1
Policy letter private person 8	High understanding of the contradictions in today's debate on GMOs with specific clear recommendations of what to do	7.7	7.7	The need to understand that the main point is the impact, not the method; and that it is scientific information and on ground experience what it needs, not politics	8.7	9	Co-production where it is needed to understand both how the technology is formed and the social dimension.	8.8	8.8
Policy letter private person 9	By asking logic questions and presenting easy read illustrations that intuitively create an emotional impact and skepticisms on GMOs	2	8	Speculative questions about the possible negative consequences about biological competition among species	2.4	1	Sees the problem from a technological deterministic approach and defines models for anticipation	8.9	1
Policy letter private person 10	Little authority as a document as it has no personal or institutional background	1	2	Propose an alternative way to address uncertainty of level categorization of risk and lack of information of the proposed labeling	5		Tendency to address the issue from a social perspective as labelling is dependent to how people what to address the issue	5.5	5

Policy letter private person 11	Presents a well historical scientific and technical understanding of GMO regulation, policy and public perception within Norway	8	8.3	Disclosing the contradictions, background information and practical consequences of the law	1	6	Large tendency to denote the technological characteristics for embodying the lobby of the industry	8.6	4.5
Policy letter private person 12	Title and institution	5	5	Naming the three concrete technical issues of the law	5	9	Gives a midway response, not especific	6	6
Policy letter private person 13	Alternative vision of GMO discussion based on a quantitative understanding of reality	2	5	Research and general knowledge about DNA is now well established as there are alternative visions	1	1	Neither technological or social deterministic as he addresses the issue through a quantum understanding of reality	8.8	1