Talking about the precautionary principle in Norwegian print media

1 Introduction

The natural world is complex and sometimes humanity's forays into it produce unpredictable, unintended and harmful consequences. Sometimes unintended consequences take the form of catastrophic events, but often they take the form of nearly imperceptible, incremental degradation of the natural environment and the human condition. In lieu of infallible knowledge and perfect foresight, society needs tools that sensitize us to the incompleteness of our current understanding of natural and sociotechnical processes, and that permit society to take anticipatory action against nascent threats to its ecological basis.[1] The precautionary principle is one such tool, and one that has proven to be both useful and controversial.[2] In this report, I aim to investigate when and how the precautionary principle enters into Norwegian public discourse by means of a media analysis.

The precautionary principle, though there are many formulations of it, generally obliges decisionmakers to decide on a course of action if there are plausible grounds for concern. If a technology, product, practice or intervention poses a serious threat, incomplete or uncertain knowledge cannot be used to justify a delay in action. Norway played its part in pushing for the precautionary principle's international breakthrough at the 1992 Rio Convention,[3] and every Norwegian cabinet since Brundtland's premiership has vowed to adhere to it in its environmental policies. The principle has entered into numerous Norwegian laws, whether explicitly or implicitly, and can be invoked by decisionmakers on a wide range of issues (cf. Bugge, 2019). As we shall see, the precautionary principle is also frequently invoked in Norwegian news coverage and in broader public discourse. In this report, we explore two topics that have elicited debates on the management of uncertainty and risk in other European societies: genetically

[1] Sheila Jasanoff (2003) speaks of "technologies of humility", technologies that permit us to move beyond the notion that the entanglement of nature and the social will generally produce more or less predictable outputs. For an accessible and detailed plea for a more ecologically attuned legal framework, see Capra & Mattei (2015).
[2] The role of the precautionary principle in EU environmental and health regulation is a recurring point of contention in EU-US trade talks. In the scholarly literature, the principle has perhaps found more notable detractors than it has supporters (see e.g. Sunstein, 2012).
[3] See Cameron & Abouchar (1991) and Aftenposten 06.06.1991, "Viktig skritt for miljøet", an opinion piece on the Rio Declaration by Gro Harlem Brundtland.

modified organisms and neonicotinoid pesticides.[4] Both are issues where national and EU decisionmakers have made use of the precautionary principle. They are also exemplary of a purported tension between societies' need to protect human health and the environment against potential but not fully understood hazards, and their need to retain competitiveness in international markets. Over time, a number of actors have argued that exaggerated precaution may reduce societies' capacity for innovation and scientific discovery, urging decisionmakers to be cautious in the exercise of precaution.[5] In this report, I seek to investigate whether these European debates have found a home in Norway as well.

The purported antinomy between precaution and innovation can be considered subsidiary to a broader tension in the management of capitalist societies: the conflict between environmental conservation and protection on the one hand, and economic growth and regional development on the other.[6] In order to further shed light on how this tension is resolved (or not), both politically and discursively, the report closes out by discussing the Førdefjorden case. In it, representatives of one scientific community highlighted a number of knowledge gaps and uncertainties, and explicitly called for the use of the precautionary principle in a planning process geared towards the construction of a marine waste disposal site in a fjord on the Western coast of Norway. The case is meant to illustrate how the precautionary principle has entered Norwegian decision-making and public discourse on environmental issues, and to indicate some fault lines at the interface between science and political decision-making in Norway.

1.1 The precautionary principle and its investigation

Although the precautionary principle has deep historical roots in some societies,[7] it is customary to start any discussion of the precautionary principle with the Rio declaration, and its fifteenth principle of environmental policymaking. It reads as follows:

[4] See for instance Drivdal & van der Sluijs (2021).
[5] See for instance Sunstein (2005), Alemanno (2013), Löfstedt (2013) and Aerni (2019).
[6] The precautionary principle, then, enters into decision-making processes when the true costs of a given intervention are not precisely known. It urges decision-makers to make allowances for hidden or unforeseen costs.
[7] For a discussion of the German *Vorzorgeprinzip,* and an appreciation of Norway's part in precipitating the precautionary principle's international breakthrough, see Cameron & Abouchar (1991).

> In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.[8]

Side-stepping the numerous caveats found in the declaration's formulation of the principle (or approach), the precautionary principle obliges all signatories to protect the environment.[9] In the face of serious or irreversible damage, action needs to be taken even if the threat is not fully and scientifically understood. The principle can be construed of as a tool for the resolution of decision problems that emanate from incomplete or uncertain scientific knowledge.[10] Serious threats – even if they are not fully understood – demand serious and timely action. It also offers a discursive or argumentative rule: if there is a threat of serious harm to the environment, uncertainty cannot be called upon to justify inaction.

In the decades since the Rio declaration, all Norwegian cabinets have professed a commitment to the precautionary principle. The principle first entered Norwegian law with the introduction of the Nature Diversity Act (NDA) in 2009. The Act is generally applicable and holds that public decision-making must seek "diversity of habitat types within their natural range and the species diversity and ecological processes that are characteristic of each habitat type", and conserve "species and their genetic diversity for the long term and to ensure that species occur in viable populations in their natural ranges."[11] In support of said objectives, the Act stipulates a set of principles that serve as guidelines for public decision-making, among them the polluter pays principle, the ecosystems approach *and* the precautionary principle. Section 9 of the Act reads

> When a decision is made in the absence of adequate information on the impacts it may have on the natural environment, the aim shall be to avoid possible significant damage to biological, geological or landscape diversity. If there is a risk of serious or irreversible damage to biological,

[8] See Principle 15 of the 1992 UN Declaration on Environment and Development.
[9] The declaration, of course, is non-binding.
[10] While some argue that the precautionary principle is an incomplete and incoherent decision rule, many observers argue that the precautionary principle is not a rule of action at all. See for instance "Is the precautionary principle really incoherent?" by Thomas Boyer-Kassem (2017).
[11] Cf. Sections 4 and 5 of the Nature Diversity Act.

> geological or landscape diversity, lack of knowledge shall not be used as a reason for postponing or not introducing management measures.

Norway's commitment to the principle in the domain of nature conservation should not be overstated, however. According to Section 14 of the act, the precautionary principle – along with the full range of fundamental principles laid down in the law – "shall be weighed against other important public interests." This means that even if there is a plausible threat of serious harm against any of the Act's policy objectives (e.g., against the diversity of environment types), decision-makers may nonetheless rule in favor of a harmful intervention (see Bugge, 2019).

The precautionary principle is also found in the Marine Resources Act.[12] The act stipulates that the exploitation of marine resources must be in accordance with the *precautionary approach*.[13] Within the ambit of the Act and the international fisheries management system, the principle (or approach) has become synonymous with a margin of safety in the regulatory-scientific assessment of fish stocks.[14] The precautionary principle of the Marine Resources Act is not open-ended regarding the sources of uncertainty, the definition of serious harm *nor* on the set of measures that can be taken to ameliorate identified but uncertain threats (cf. Bugge, 2019). In this sense, it is questionable whether the Act can be said to truly implement the precautionary principle.

In addition to the acts that contain an explicit reference to the precautionary principle, a number of other acts make implicit allowances for the principle. Article 10 of the Gene Technology Act can be said to implicitly impose a hard precautionary requirement: "The deliberate release of genetically modified organisms may only be approved when there is no risk of adverse effects on health or the environment." Clearly, the gene technology act seeks a level of environmental protection that is far more restrictive than e.g., the Nature Diversity Act.[15] This has introduced inconsistencies within the broader food regulation regime.[16] According to

[12] See Section 7 a of the Marine Resources Act https://www.fiskeridir.no/English/Fisheries/Regulations/The-marine-resources-act

[13] Though there is some tradition for considering the precautionary approach as subsidiary to the principle within marine resource management, the two are used interchangeably in Norwegian legal documents. Little wonder: the Rio Declaration, too, speaks of a precautionary approach to environmental threats.

[14] See e.g. de Bruyn et al. (2012) for a discussion of the precautionary approach to fisheries management.

[15] Curiously, much of the Norwegian discussion of GMO liberalization seeks to modify the precautionary principle, rather than the act's stated level of protection.

[16] See below.

Bugge (2019: 158), there are numerous other instances of *implicit* precautionary principles in Norwegian legislation, for instance in § 7 of the Pollution Act and § 2 of the Environmental Information Act.

2 Questions and methods

The first question I seek to answer, is whether the precautionary principle has entered into Norwegian public discourse. The answer is yes. Moreover, and using an admittedly naïve numerical approach, I demonstrate that – unsurprisingly – the principle is primarily invoked in the context of threats to the environment and human health.

Using the Norwegian media-database Retriever, it is possible to trace the precautionary principle over time through text-based media; it is also possible to get a low-resolution overview of the principle across topical domains (e.g., climate and environment, business, foreign affairs). In order to outline the themes that inspire journalists and participants in Norwegian public debates to invoke the principle, we have opted to manually code all newspaper items in the two newspapers that most frequently refer to the precautionary principle: Aftenposten and Nationen. Aftenposten is a Norwegian quality daily. Although the newspaper must be said to be Oslo-centric, it has a large readership and should be considered more-or-less representative of broader debates in the Norwegian public sphere. The second newspaper, Nationen, can also be a considered a "most likely" case on the topics of neonicotinoid and GMO regulation.[17] Nationen is the "newspaper of the districts", and prioritizes coverage of agricultural issues, food production, food safety and food security. I have manually catalogued all items that refer to the precautionary principle in these newspapers according to their date of publication, authorship, newspaper section and topic. This allows us to gauge which issues appear to inspire the invocation of the precautionary principle in the Norwegian public sphere over time.

The second question, and one that cannot be answered definitely, is *how* precautionary issues are dealt with in the Norwegian public sphere, and how its participants engage with the precautionary principle itself. In order to do so, I have elected to present three tentative and highly diverse case dives into three precautionary cases: the call on part of scientists for a

[17] See Gerring and Cojocaru (2016).

liberalization of the rules governing GMOs in Norway; news reports on the relationship between neonicotinoid pesticides and pollinator decline, and news reports on the introduction of a marine waste disposal site in a vulnerable fjord (Førdefjorden) on the Western coast of Norway. In the GMO case, I present a group of natural scientists' engagement with public sentiment on genetic modification, and their attempts at renegotiating the precautionary principle. In the latter two cases, I illustrate how issues of scientific uncertainty, complexity and ambiguity are easily subsumed under the broader rubric of environmental conservation vs. socio-economic interests.

3 A numerical description of the precautionary principle in Nationen and Aftenposten

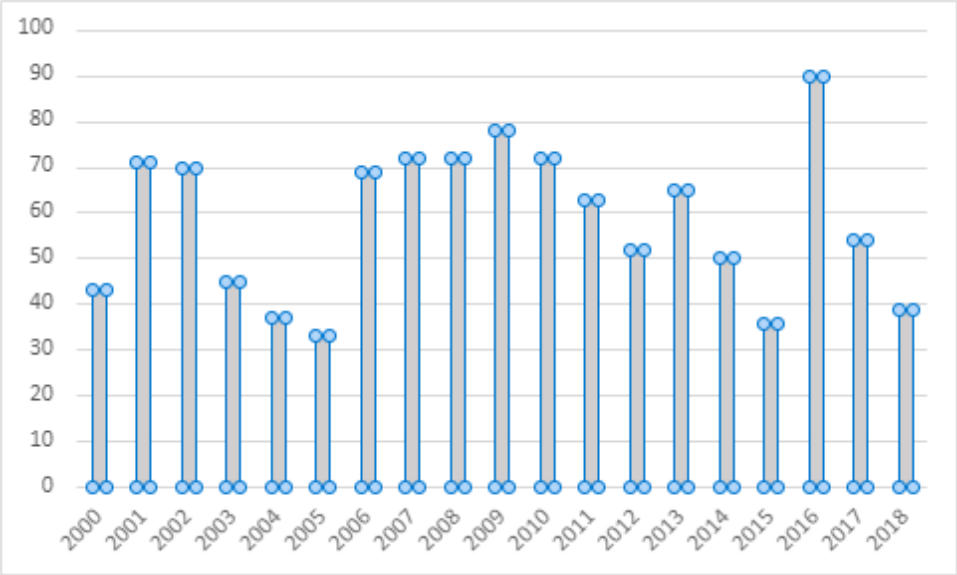
In this section, I seek to provide an overview of the use of the precautionary principle two Norwegian papers, and illustrate when and on which topics the precautionary principle has tended to crop up.

3.1 Numbers in time

Using the Norwegian media database Retriever, and restricting our search to the printed editions of national newspaper, the precautionary principle has been invoked approximately 11000 times since the turn of the millennium (see figure 1).[18] The greater part of references have been made in four newspapers, and two newspapers alone (Aftenposten and Nationen) account for approximately half of all references to the principle over the course of the period. As stated above, these two newspapers have been selected for a closer examination.

Figure 1. References to in Norwegian national newspapers (Rikspresse, 2000-2018)

[18] In Retriever, 11 daily and weekly newspapers are considered part of the national *rikspresse.*



Both Aftenposten and Nationen have referred to the precautionary principle frequently over the last decades. Between 2000 and 2018, Aftenposten made 318 references to the precautionary principle. Between 2006 – which is as far back as Retriever will take us is in this case – and 2018, Nationen made 210 references to the principle. As can be seen in table 1, the two papers make equally intensive reference to the principle.

Table 1. References to the precautionary principle in Aftenposten (2000-2018) and Nationen (2006-2018)

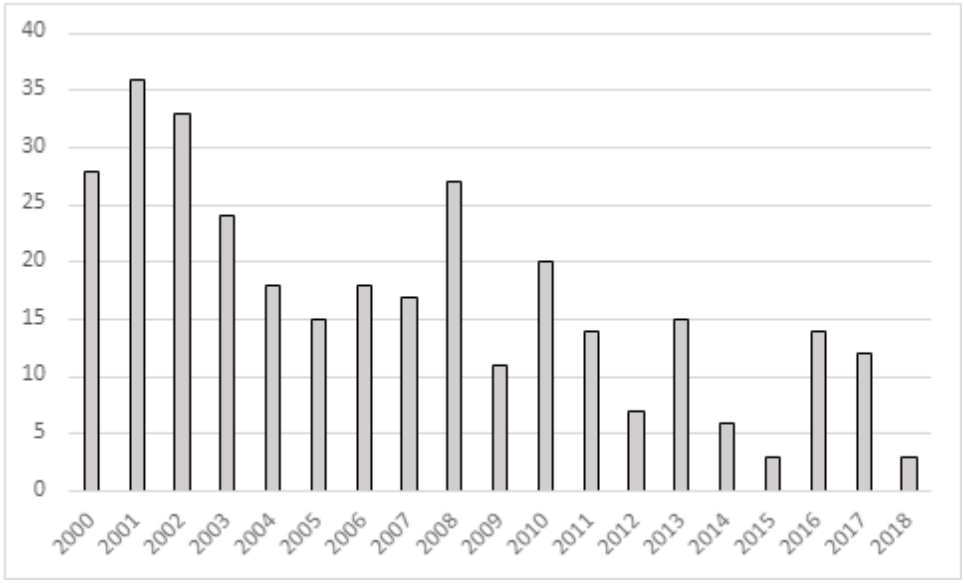
	Aftenposten	Nationen
Total references to PP	318	210
Average per year	17	16

Source: Retriever. Search term: pre-cautionary principle (føre-var prinsippet)

The most striking feature of figure 2, is the apparent decline in Aftenposten's use of the precautionary principle over the period. The significance of the downward trend in Aftenposten's use of the term should not be exaggerated, however. Partly, the extensive use of the term at the start of the period can be attributed to Aftenposten's surprisingly intensive coverage of the 2002 UN World Summit on Sustainable Development in Johannesburg. To be sure, sustainable

development is a term that Norway can rightfully claim some ownership to.[19] Norway – represented by its immensely popular and photogenic Minister of the Environment, Børge Brende – was also seen to take a leading role in the proceedings, and to champion a "precautionary approach" to the issue of economic development in the face of looming climate changes. In the newspaper's coverage of the summit, the principle enters into the coverage as something of a slogan on part of the Norwegian delegation and some NGOs. The principle also appears in Aftenposten's coverage of the initial phase of the "war on terror", and specifically the United States' "pre-emptive" invasion of Iraq in 2003. Clearly, the principle should not have appeared in these news items. Importantly, none of these news reports attempt to define or explain the principle.

Figure 2. Annual references to the precautionary principle in Aftenposten (2000-2018)

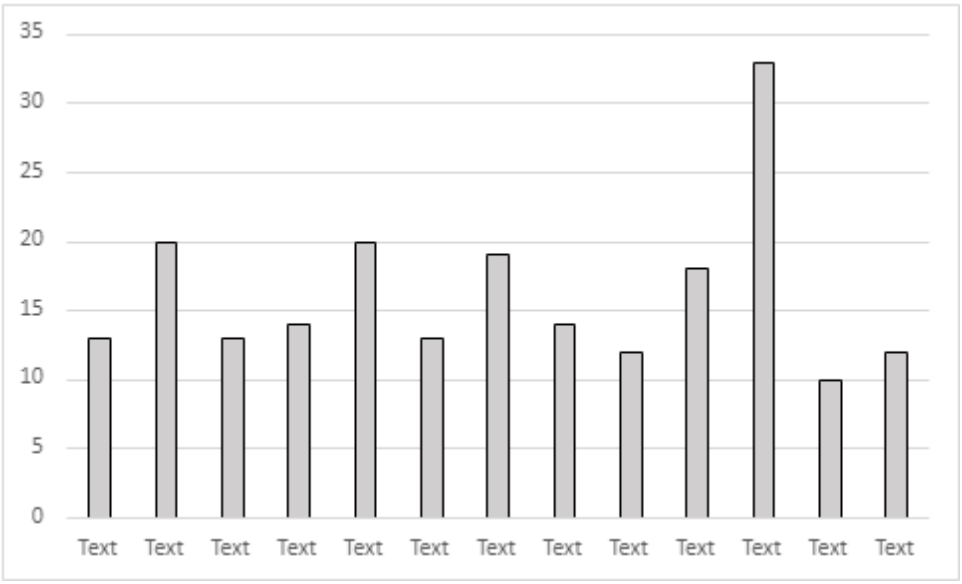


In Nationen, the only obvious historical hotspot is 2016. This outlier is largely explained by the on-going negotiations on the Transatlantic Trade and Investment Partnership. As we shall see below, Nationen is *heavily* invested in coverage of GMO regulations. In their coverage of the negotiations, Nationen consistently highlighted the American stance on the precautionary

[19] A Norwegian prime minister, Gro Harlem Brundtland, chaired the Commission that would coin the term in their report "Our Common Future" (UN, 1987).

principle, and the potential ramifications of a deal for the European risk management regime broadly, and GMOs specifically.

Figure 3. Annual references to the precautionary principle in Nationen (2006-2018)



3.3 References to the precautionary principle by topical domain

As previously stated, all items referencing the precautionary principle have been coded according to its principal topic. My coding is heavily influenced by a previous and similar analysis of The Guardian.[20] As can be seen in table 2, Aftenposten's use of the concept reveals that Norway has a lot of nature and extracts heavily from it. Climate change aside, marine conservation and fisheries is the topical domain in which the principle is most frequently invoked, followed by nature and wildlife conservation. Thereafter follow public health and safety (a very broad category) and controversies on the issue of oil exploration in vulnerable seas. Broadly speaking, then, the precautionary is almost exclusively invoked in reference to human health or the environment.

[20] At time of writing, the report has not been made available by the RECIPES consortium. But see www.recipes-project.eu

Table 2. Topics on which the precautionary principle has been invoked, Aftenposten (2000-2018).

Topic	References
Climate change	**31**
Marine conservation	**28**
Offshore petroleum	**27**
Nature and wildlife	**26**
Public health and safety	**26**
International cooperation on environmental issues and climate change	**21**
Medicine	**16**
Warfare, terrorism and policing	**14**
Genetically modified organisms	**11**
Nuclear power and radiation	**10**
Internal partisan disputes	**10**
Waste disposal	**9**
Wireless radiation	**7**
Information technologies	**4**

Source: Retriever. Search string "føre-var prinsippet" and variations thereof.

Not surprisingly, Nationen has a far stronger focus on agricultural and food safety issues than Aftenposten. Strikingly, GMOs account for a quarter of all references to the precautionary principle in Nationen. News coverage and debates on animal health and food safety, along with the pesticide glyphosate (and pesticides more generally), have elicited their fair share of references to the precautionary principle as well. In Nationen, too, the principle is often used in news items and opinion pieces on nature conservation, fisheries, oil exploration and other modes of resource exploitation. On the pages of Nationen, the precautionary principle has also been invoked – albeit sparingly – with reference to endocrine disruptors, the EU's REACH directive, neonicotinoids and Crispr. These are topics that failed to make an appearance in our sample of items from Aftenposten.[21]

[21] Both Crispr and neonicotinoids *are* discussed on the pages of Aftenposten, but the precautionary principle is not invoked in these items.

Table 3. Topics on which the precautionary principle has been invoked, Nationen (2006-2018).

Topic	References
Genetically modified organisms	**50**
Nature and wildlife conservation	**28**
Climate change	**20**
Animal health	**16**
Offshore petroleum	**14**
International trade	**13**
Glyphosate	**10**
Marine conservation	**7**
Waste disposal in Førdefjorden	**7**
Wolf culling	**6**
EU politics	**4**
Pesticides	**4**
EU chemical regulation (REACH)	**4**
Public health	**3**
Neonics	**2**
Endocrine disruptors	**2**
New gene editing techniques (Crispr)	**2**

Source: Retriever. Search string "føre-var prinsippet" and variations thereof.

4. Qualitative deep dives – three cases of precaution

In the following sections, I trace three issues through select Norwegian newspapers: GMOs, neonicotinoids and the Førdefjord case. The topics of GMOs and neonicotinoids have partly been selected to illustrate how the precautionary principle and precautionary arguments have entered into news cycles and public discourse, and partly to investigate whether debates have arisen on the commensurability of precaution and Norway's innovative capacity. Elsewhere, it has been suggested that the precautionary principle may cause collateral damage by limiting private business' willingness to invest in new technologies and new solutions (cf. Löfstedt, 2013; Alemanno, 2013). Moreover, I consider the purported – and potentially artificial – antagonism between precaution and scientific discovery and innovation as a subset of a more general tension, namely between environmental protection and economic development. Doubtlessly, a society's willingness to protect human health and the environment *will* necessarily affect the production

and exchange of goods and services. The Førdefjord case is meant to be illustrative of how this tension is resolved (or not) both politically, bureaucratically and discursively.

4.1. Genetically modified organisms in Norwegian news coverage and public discourse

4.1.1. Brief on the legal context of the GMO debate in Norway

As previously stated, the Nature Diversity Act (NDA) is a cross-sectoral and generally applicable act. In the face of potential serious or irreversible harm to nature diversity, public decision makers – whether they are deciding on the construction of windmills or the introduction of a new GMO – are obliged to acknowledge the precautionary principle and consider *potential* serious threats to the stated policy goals of the act. Norway has implemented the EU Directive 2001/18 EC on the deliberate release into the environment of genetically modified organism. As a result, all GMOs approved by the EU are automatically approved in Norway as well. Yet, and owing to an exemption clause from the European Economic Area Agreement, Norway retains an autonomous and deviant legal framework for the assessment of GMOs. In addition to the rules on risks to health or the environment found in the EU directive, Article 10 of the Norwegian Gene Technology Act of 1993 stipulates that all GMOs must be assessed according to "societal utility", "ethics" and "sustainability".[22] The precautionary principle – which is largely confined to the assessment of risks towards health and the environment – is but one node in a larger network of legal conditions that jointly militate against the introduction of GMOs in Norway. To my mind, the most significant node by far is the stipulation that the

> (…) deliberate release of genetically modified organisms may only be approved when there is no risk of adverse effects on health or the environment.

As we shall see below in our discussion of the Førdefjord case, the Gene Technology Act aims for a level of protection that moves far beyond that of the Nature Diversity Act. This is a source of a regulatory inconsistency which is frequently deployed in support of GMO liberalization.

[22] See e.g. Bioteknologirådet (2018) Forslag til oppmykning av regelverket for utsetting av genmodifiserte organismer

4.1.3 The Norwegian debate on GMOs – much ado about what?

GMOs are not in high demand in Norway, and both consumers and producers are reluctant to permit the introduction of GMOs in Norway – whether as foods or as an input in food production.[23] A broad alliance consisting of farmer's associations, activists, consumer associations, research institutions and governmental agencies have traditionally favoured restrictive regulation of genetically modified crops and foods.[24] As we have seen above, there is no general ban on genetically modified organisms. Norway does however have a very restrictive framework for the assessment of GMOs, and one that introduces a number of considerations in addition to those implemented by the EU (see EU Directive 2001/18 EC). For this reason, it is hardly surprising that the Norwegian stance on GMOs has inspired some debate.

In what follows, I have decided to let the proponents of GMO liberalization guide my way through public discourse on GMOs in general, and the precautionary principle in particular. The reasoning is simple: the law and the overall administration of GMOs rests on a number of considerations, some of which have been highlighted above. Many of them are readily and frequently presented in support of the precautionary principle in general, and on the issue of GMOs in particular. The most frequently voiced, explicitly precautionary arguments against GMOs are these[25]

> The (long-term) health and environmental effects unknown or uncertain
>
> There is a dearth of *independent* research into the impact of GMOs
>
> GMOs risk contaminating broader ecosystem and causing harm to extant biodiversity

In this instance, these arguments are forwarded in support of the status quo, as an elucidation of the sensibility of it, or as part of a more-or-less strategic communication in support of an

[23] In a recent proposal for a relaxation of the rules governing GMOs, the Advisory Board for Biotechnology acknowledges this fact. Recent decisions to ban the introduction of GMOs approved by the EU have tended to stress the point as well (Bioteknologirådet, 2018).

[24] See here (bioteknologiradet.no)

[25] Participants also deploy a mesh of ethical, economic, political and strategic arguments against the release of GMOs into Norwegian nature or pantries. The proposition that GMOs are objectionable because they bolster the oligopolstic power of agrochemical multinationals is not a precautionary argument in the sense of the precautionary principle, however.

interested position. These arguments are most frequently presented by politicians, GMO-activists, environmentalists and farmer's associations. More often than not, they are served as soundbites following an administrative decision to ban a specific GMO. By contrast, the arguments *against* precaution in the case of GMOs are on the offensive, and have the potential to change the world, or at least Norway, for better or for worse.

4.1.3 Science denialism and the health effects of GMOs

One of the most widely deployed arguments in favor of GMOs is that opposition to them is largely – if not entirely – premised on ignorance.[26] In an opinion piece that initiated a debate on the uses and abuses of GMOs in 2008, professor of molecular genetics Hilde-Gunn Opsahl Sorteberg implied that Norwegian skepticism towards GMOs was premised on "unfounded intuition" and not "reality as we know it".[27] The opinion piece inspired a slate of responses, mostly expressing opposition to GMOs on a variety of grounds and from a diverse set of vantage points.[28] Some, however, took issue with Sorteberg's contentions without taking a stance on the issue of GMOs per se.

There is a tendency among proponents of GMOs – most of whom are either natural scientists or self-identified rationalists – to reduce their opponents' starting positions to one of more-or-less complete ignorance. According to some proponents of GMO liberalization, the contention that GMOs are "unnatural" is a core argument in support of a restrictive legal framework.[29] Consequently, some natural scientists have sought to clarify the matter by explaining that genetic change is a very natural phenomenon and, indeed, a necessary precondition for life on earth:

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[26] See e.g. Wynne (2001) and Biddle (2018). In a widely cited article, Nobel laureate Norma Borlaug (2000) warns against the threat of antiscience zealotry, and urges societies to embrace biotechnology in the battle against global hunger. Tagliabue (2017) argues that the EU's legislation on GMOs is both "botched and convoluted", premised on a toxic mixture of non-scientific nonsense and misguided protectionism. See also Twardowski & Malyska (2014).

[27] Aftenposten 07.01.2008, Genmodifisering må til (Genetic modification is necessary)

[28]

[29] The naturalness of an intervention *is* central to the EU's regulation of GMO; it does not have to be.

> … life on earth arose as a result of, and is characterized by, constantly changing genes, both through mutations of single genes, and through the exchange of DNA between species. Genes are not as immutable as the opponents of genetically modified plants appear to think.[30]

Professor of plant science, Odd Arne Olsen, is driving towards another, perhaps more actionable argument: there is no qualitative distinction between traditional modes of plant breeding and genetic modification.[31] Both involve an intervention into the natural trajectory of species to render them more amenable for human cultivation and consumption.[32] Both approaches have potential consequences for the natural environment and the biodiversity it sustains. In the words of Andreas Wahl, who is perhaps the most visible popularizer of the natural sciences in Norway today, "(h)umans have tampered with nature for thousands of years, and genetic modification is simply the newest technique in our arsenal."[33] Genetic modification is a very human activity. The question of whether genetically modified organisms should be regulated with any greater degree of stringency than conventional crops with similar properties remains underdeveloped in the Norwegian public debate.[34]

Moreover, proponents of GMOs regularly argue that their detractors consistently overstate the risks posed by genetic modification. Worse, they ignore scientific evidence to the contrary when they continue to argue that GMOs are not safe for human consumption.[35] In her original opinion piece in Aftenposten, professor Sorteberg argued that 300 million Americans "and even more Chinese" have eaten a GMO-intensive diet for "many years", yet no adverse health effects have been reported.[36] This proposition has become something of a staple in the Norwegian debate on GMOs and has been redeployed repeatedly by proponents of GMO liberalization, among them Conservative parliamentarian Heidi Nordby Lunde.[37]

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[30] Aftenposten 20.11.2014, Nyttige redskap for matproduksjon

[31] In *Frontiers in plant science*, for instance, researchers have consistently called for a process-neutral regulation of crops in Europe.

[32] The debate on *natural* vs. *unnatural* interventions into nature is needlessly complicated by the fact that the EU's rules on GMOs exempts mutagenesis from its restrictive assessment procedures owing to its "long history of safe use".

[33] Nationen 29.09.2016, Går løs på GMO-kritikken

[34] But see Bioteknologirådet (2018).

[35] To wit, few participants in Norwegian public discourse argue that GMOs *are* unsafe; quite a few do argue that their safety has been convincingly demonstrated.

[36] Aftenposten 07.08.2008, Genmodifisering må til

[37] Nationen 16.05.2016, Kunnskap og Frankensteinmat

In an opinion piece entitled "Keep the GMO-debate factual", a student of molecular biology takes issue with the Farmers' Assocation's continuous use of the phrase "... we still do not know enough about the health and environmental effects of GMOs."[38] Citing a slate of meta-studies, the author argues that we are well past the point where we can plea ignorance on the health effects of genetic modification.[39] There are none.[40] In an opinion piece titled "The science deniers", Jan Arild Snoen accuses the ruling Conservative party of abandoning science in their decision to ban a GMO (corn 1507) that had been ruled safe by both the Scientific Committee on Food and the Environment (VKM) and the Norwegian Food Safety Authority: "Instead of siding with science and arguing that genetically modified corn is safe and should be allowed, the cabinet (…) is now considering renewing the ban."[41] Snoen goes on to say that there is "both a broad and deep consensus that GMOs pose few if any risks, while providing large opportunities for the improvement of human welfare." Snoen cites a metastudy by Klümper and Qaim (2014) which indicates that genetic modification on average reduces pesticide use by 37 per cent, increases yields by 22 per cent and farmer's profit by 68 per cent.[42] By way of conclusion, Snoen argues that opposition to GMO is tantamount to climate change denial, and urges the Conservative party to come back into the fold:

> Instead of chickening out, the Conservatives should seek an alliance with the most rational fractions of the Labour party and not merely accept these two corn strains, but pursue a radical transformation of Norwegian politics, so that it mirrors science rather than prejudice and special interests.[43]

Snoen fails to account for the properties of the corn in question,[44] and for the reasoning that would eventually justify the ban (see discussion above). Luckily, the then head of the Norwegian

[38] This phrase has been frequently repeated by anti-GMO NGOs and farmers on the pages of Nationen.
[39] Nationen 28.03.2018, Hold GMO-debatten faktabasert
[40] See also Aftenposten 13.11.2014, Vi kan ikke si nei til genetisk modifisert mat
[41] Aftenposten 18.11.2014, Internrevisjonen: Vitenskapsfornekterne
[42] ibid. See also Wilhelm Klümper and Matin Qaim (2014) A Meta-Analysis of the Impacts of Genetically Modified Crops, in PLOS ONE.
[43] ibid. When explaining why the Cabinet had not initially favored a ban of the corns in question, then Environmental minister Tine Sundtoft explained that growing corn in Norway would be pointless. See Bergens Tidende 04.11.2014, "Feil i BT om genmais"
[44] The corn in question has close to zero utility in Norway, and cannot readily be grown in the cold Norwegian climate. Indeed, the environmental minister warned against banning the corn in question because it would be pointless: it will not be grown in Norway, at any rate. See Bergens Tidende 04.11.2014 Feil I BT om genmais

Biotechnology Advisory Board, former minister of finance Kristin Halvorsen, wrote an opinion piece to shed light on the decision:[45]

> Regarding corn 1507, we find it straightforward to conclude in light of the Gene Technology Act's rules on ethics and sustainability: To facilitate an increase in the use of glufosinate-ammonium in global farming is not in keeping with the law's principle of sustainable development. And it is not in keeping with the law to contribute to expose foreign farmers to health risks we do not tolerate in Norway. Therefore, the government should ban corn 1507.[46]

In the decision in question, the Advisory Board had intervened and urged the cabinet to ban a GMO that had been found to satisfy the prevailing safety standards. The intervention, and the decision, proved divisive, and has led some parties to press for a reconsideration of the role of ethics, sustainability and social utility in the assessment of GMOs.[47] Since 2014, and in light of recent and major biotechnological advancements, the Advisory Board has worked for a major revision of the Norwegian and European biotech regulations.[48]

4.1.4. Apples and apples – GMOs, environmental risks and regulatory inconsistencies

One frequently voiced justification for precaution against GMOs, is that they pose a threat to surrounding ecosystems and to biodiversity. Indeed, this seems to be the most frequently voiced, strictly precautionary concern. As the debate on GMO liberalization has progressed, few proponents of GMO liberalization have taken a considered position on this issue. There are partial exceptions, however. In an opinion piece titled *We cannot say no to genetically modified*

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[46] Nationen 28.05.2016, Mais 1507 må forbys

[47] In a letter answering a call for opinions on today's legal framework, a group of scientists made the following comment: "Ethics, sustainability and societal utility builds on subjective assessments that have historically undermined objective assessment criteria, like health and environmental risks. This subjectivity in the legal framework makes it difficult to develop this industry in Norway, in so far as it is difficult to predict the outcome of an assessment process, even when a new strain must be considered safe for both health and the environment. For instance, corn 1507 was banned on ethical grounds, although all available scientific data demosntrated its safety both for humans and the environment, something that the agency in charge of the risk assessment, along with EFSA, concluded."

[48] Under the Norwegian proposal, conventional, transgenic GMOs would still be subject to a restrictive regulatory regime. Many applications of new breeding techniques would be subject to a much more permissive arrangement, however. See Bioteknologirådet (2018).

food, two notable plant scientists appear at first to engage with this issue, but proceed to deflect by means of decorative plants:

> Another argument which is frequently deployed, is that GMOs can contaminate Norwegian nature. Meanwhile, Norway imports large quantities of decorative plants that bring stowaways in the form of Spanish slugs and fungi that are very harmful to Norwegian nature. Yet nothing is done to halt the import.[49]

Whether the biodiversity argument is a reasonable concern remains unclear based on my reading of the newspaper coverage.[50] What *is* clear, is that threats emanating from GMOs are judged more severely than threats emanating from other sources, be they decorative plants, paper mills or marine waste disposal sites. Moreover, and although the argument remains somewhat underdeveloped in public discourse, most plant scientists balk at the fact that identical products face different regulatory regimes, depending on the technology used to spur on desirable genetic changes. As stated by Hvoslef-Eide

> (g)ene technology implies smaller interventions than conventional techniques that use chemicals and radiation to encourage random mutations and chromosome changes that may lead to a desirable property.[51]

4.1.5 Precaution is preventing us from anticipating climate threats

Proponents of national GMO liberalization tend to argue that their detractors fail to recognize the potentially transformative, emancipatory power of genetic modification. The world is facing climactic and demographic challenges that jointly place the world's food supply under considerable strain. In her original opinion piece, Sorteberg argues that genetic modification is a necessary precondition for bolstering the world's food supply.[52] So do Andreas Wahl, parliamentarian Heidi Nordby-Lunde, Professor Olsen, Jan Arild Snoen, Nobel-laureates May-

[49] Aftenposten 13.11.2014, Vi kan ikke si nei til genmodifisert mat. In a spurious aside, Hvoslef-Eide and her co-author also point out that although 21 Germans lost their lives owing to an E.Coli outbreak traceable to a shipment of organic beansprouts, no one has proposed a general ban on organic produce.
[50] It seems plausible, however, that Norway's capacity to enforce a wholesale ban on the import of foreign decorative plants would be considered an infringement of the free movement of goods within the EU.
[51] Aftenposten 13.11.2014, "Vi kan ikke si nei til genmodifisert mat"
[52] Aftenposten 07.01.2008, Genmodifisering må til

Britt and Edvard Moser and many, many more.[53] And they may be right. According to Jan Arild Snoen, the Norwegian stance on GMOs cannot be considered in isolation: "As demonstrated by Richard Paarlberg in his book *Starved for Science*, the serious consequences of saying no primarily affect poor nations in the form of higher food prices and reduced export opportunities."[54]

According to some natural scientists, and other contributors to the debate, the Norwegian stance on GMOs is preempting the development of GMOs that would be beneficial to Norwegian agriculture, and limits scientists' opportunities to contribute to the development of products for farmers in developing countries. Seemingly, the precautionary principle is one of the principal obstacles to the realization of the full potential of GMOs:

> The precautionary principle is a recognized principle for the management of nature. Risk assessments, however, imply that potential danger is weighted against benefits. In the case of genetic modification, this means that dangers must be weighted against its utility. In my opinion, experiences with GMOs indicate that the risk of harm is small compared to realized and potential benefits.[55]

Professor of plant sciences, Odd Arne Olsen, appears to think that the precautionary principle has been used to enforce a general ban on GMOs in Norway. Alternatively, the professor appears to argue that genetic modification *should* be subject to a single general approval, and not – as today – be subject to individual assessment, based on the properties (risk profile, social utility, ethics and sustainability) of single products. If GMOs were considered as a whole, the professor argues, then the potential and realized social utility of GMOs would outweigh their potential harm by far. Others seem to argue that the most precautious approach to GMOs would be to tolerate them

> Academic freedom must be safeguarded. Noone wants politics to decide what is deemed scientifically correct. Thorough, knowledge-based development depends on quality and strong research communities. We cannot escape choices and priorities, however. A "no" can have equally destructive consequences as a "yes", depending on the issue at hand. It would be

[53] Nationen 30.06.2016, 110 nobelprisvinnere ber miljøvernere oppgi GMO-motstand
[54] Aftenposten 18.11.2014, Internrevisjonen: Vitenskapsfornekterne
[55] Aftenposten 20.11.2014, Nyttige redskap for matproduksjon

> irresponsible, and a misuse of the precautionary principle, to abandon the possibilities (of GMOs) without weighing them against the risks.[56]

Again, professor Sorteberg *appears* to imply that the precautionary principle has been used to enforce a general and final ban on genetic modification, and that this process has not taken due consideration of the many and potentially fruitful applications of genetic modification. As we have seen, the professor argues that genetic modification is a necessary tool for preventing future food shortages.[57] However, and it bears repeating, the Norwegian regulatory regime proceeds on a case-by-case basis, where uncertain risks and the seriousness of potential harm are weighted against the social utility of the product in question. Others have been less tacit in their criticism of the place of the precautionary principle in the current regulatory regime. Øystein Heggdal:

> The precautionary principle is a godsend to those who oppose change, innovation and progress, because the principle implicitly demands scientific certainty before new technology can be used. Science cannot, without a shadow of a doubt, demonstrate that genetic modification is as safe as traditional forms of breeding. We do not know all thinkable and unthinkable consequences of this technology. If we did, the science of gene editing would be complete, done. But science does not work like this. If science could determine most questions without the shadow of a doubt, then it would stop.[58]

In 2008, and in response to the original opinion piece by professor Sorteberg, the then minister of agriculture penned an opinion piece in which he appears to suggest that the precautionary principle can be used to support a general and principled opposition to genetic modification.[59] This prompted a reply from the head of the National Research Ethics Committees.

> (…) it is misleading to present the precautionary approach as a mechanism for denying market access to GMOs in general. Uncertainty about serious harm must be weighed against the opportunities lost by rejecting a technology. It encourages precautionary measures, where complete avoidance is at the extreme end of the spectrum.
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> In Norway, as in the EU, it is considered meaningless to be generally for or against a technology like GMO. New products will be treated with an appropriate degree of precaution, however.

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[56] Nationen 26.09.2010, Vitenskap og GMO-frykt

[57] This is also the central contention of Norman Borlaug (2001), and many other notable scientists, activists and organizations.

[58] Nationen 12.03.2016, Forkast føre-var prinsippet

[59] Aftenposten 14.01.2008, Nei til modifisering av gener!

> GMO have a potential for positive applications, but it is left to scientists and the industry to realize it.[60]

Professor Kaiser points out that there is no general ban on GMOs, and that the legal framework is open to GMOs that are safe *and* exhibit beneficial properties. Kaiser leaves it "(…) to scientists and the industry to realize" the potential of genetic modification. It is clear, however, that a number of practitioners feel that their capacity to realize the technological potential is hampered considerably by the current regulatory regime. One contributor puts it this way

> Today's gene technology act is – for all practical intents and purposes – a ban on GMOs. Moreover, we have a very small and atypical market. For this reason, it is unlikely that producers of seeds and other products will make GMOs that are primarily adapted to Norwegian conditions. The ban preempts innovation, and we will not get GMOs that can be beneficial for Norwegian farming.[61]

Professor of plant sciences, Odd Arne Olsen, feels much the same way. He argues that public funds need to be invested in the development of high value, non-patented genetically modified organisms. This technology cannot be left to multinational corporations, not least because they tend not to develop products that are useful in Norwegian agriculture, nor to the small-scale farms typical of developing countries. Before we can reap the benefits of GMOs, however

> (…) the rules must be simplified considerably. In return, we must accept that large biotech companies gain access to our markets. The longer we labor under the current legal framework, which demands large investments in order to apply for an approval, the longer the monopoly power of the financially powerful companies will persist, and the longer we will miss out on the usefulness of genetic modification in public research and development.[62]

The argument has since been repeated on numerous occasions.[63] The current legal framework, it is argued, serves as a soft but nonetheless general ban on GMOs. If the Norwegian regulatory regime – on balance – is deemed highly restrictive, this is partly because no single GMO strain has passed the social utility test, when considered against their potential risks. The scientists appear to argue that this is so partly *because* the regulatory regime is so strict as to militate

[60] Aftenposten 06.02.2008, Ubegrunnet om genmodifisering
[61] Nationen 28.03.2016, Hold GMO-debatten faktabasert
[62] Aftenposten 20.11.2014, Nyttige redskap for matproduksjon
[63] See also Aftenposten 13.11.2014, Vi kan ikke si nei til genmodifisert mat

against the development of useful genetically modified crops. It is plausible: the Norwegian biotech industry is small, and both moderately successful and relatively secure within prevailing constraints. None of the contributions make it entirely clear how, and through which mechanisms the Gene Technology Act is strangling the innovative capacity of Norwegian agrobusinesses. Elsewhere, professor Hvoslef-Eide engages with those who argue that safe and useful applications of gene technology are entirely permissible under the current legal framework:

> (…) we have to adhere to the European regulations. It is a long and arduous process. (…) it requires a lot of documentation; it is expensive. I know (critics) say that GMOs can be approved today, but you still have to adhere to the authorities' documentation requirements. Documentation makes it expensive.[64]

The principal problem as regards the current legal framework, then, is that it is both arduous and expensive.

To my mind, it is possible to engage with the current GMO framework *without* engaging with the precautionary principle. Moreover, most proponents of GMO liberalization appear to harbour the suspicion that precaution can be tempered by a utilitarian calculus,[65] or at the very least by balancing precautionary considerations against other salient concerns. It seems a reasonable position, but a number of authors have poured considerable energies into an attempt at finally reconciling the precautionary principle and the principle of proportionality.[66] Suffice to say that all attempts leave much to be desired.[67] Although we frequently learn that the precautionary principle should only be applied after a careful consideration of the costs involved in e.g., banning a technology,[68] decisionmakers will still be left with little guidance on how to balance unknown but potentially large environmental costs against uncertain, highly prospective benefits. I am by no means saying that a more lenient regulatory stance on GMOs would set us on a

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[64] See Ser frem til poteter som er resistente mot tørråte.

[65] As stated by Opsahl Sorteberg: "My ethical point of departure is a utilitarian approach, with its particular commitments and priorities. In order for moral to have ethical value, it must depart from a correct description of all relevant facts and universal principles that we are all willing to accept under all conditions." Good luck, professor.

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[68] Business tends to argue that most applications of the precautionary principle violate the proportionality principle, simply by merit of failing to conduct a cost-benefit analysis. According to the European Court of Justice, cost-benefit analyses cut little ice when the sources of, extent of and potential ramification of an identified threat are uncertain, unknown or in dispute. Many philosophers of science are liable to concur.

uniquely destructive path. I am simply saying that a fixation on the precautionary principle on part of GMO proponents runs the risk of weakening societal capacity to deal with other, potentially ruinous practices, technologies and innovation pathways.

4.2 Neonicotinoids and pollinating insects – beyond precaution?

As stated in the introductory chapter, this report initially proceeded by identifying all articles referring to the precautionary principle in Norwegian national newspapers. Two newspapers were selected for further study; one owing to the size of its readership and its representativeness of the broader news cycle and debates in Norwegian society, the other for being a "most likely case" (Nationen, an agrarian newspaper) on issues likes GMOs, glyphosate and neonicotinoids. This initial search – which departed from variations on the search string "precautionary principle" – yielded very few references to neonicotinoids, even in Nationen. Upon further scrutiny, however, Nationen does not appear to have failed to inform its audience of on-going debates on the relationship between neonicotinoids and pollinator decline, nor on the European Union's decisions to ban three neonicotinoids in 2013 and 2018. What the newspapers have largely failed to do, is to couch the EU's decision and the broader issue of pollinator and insect decline in the language of the precautionary principle.

In the following sections, I provide a brief tour of two Norwegian newspapers' coverage of an emerging association between neonicotinoids and pollinator decline. As we shall see, day to day news coverage of new scientific studies, and of the EU's regulation of neonicotinoids, tend to emphasize the strength of the purported links between neonicotinoids and pollinator decline, and not the many caveats that tend to accompany new findings.

4.2.1 Tracing neonicotinoid coverage in two papers

As stated above, most Norwegian newspapers have devoted scant attention to the issue of neonicotinoids, although most have reported on pollinator decline. The only two papers that have consistently devoted journalistic resources to the issue are Klassekampen and Nationen. Klassekampen is a left-wing, quality daily that reports extensively on politics, sciences and

culture.[69] Between 2012 and 2020, Klassekampen published 11 news reports, bulletins and opinion pieces dealing primarily with the impact of neonicotinoids on pollinator decline. Nationen – as we have seen – is a daily newspaper that is primarily geared towards farmers. Nationen accounted for half (25) of all references to neonicotinoids (49) in Norwegian dailies over the period.

Klassekampen first mentions neonicotinoids in 2012.The first report is on an American study published in PLoS One which "indicates that pesticides are a contributing factor" behind observed increases in bee fatalities and colony collapse disorder.[70] In the report, Christian Krupke, one of the researchers behind the study, is quoted as saying: "We know that these pesticides are highly toxic, and we found them in all diseased and dying bees."[71] The research and science communication of Christian Krupke is also the subject of an opinion piece published the same year, which characterizes neonicotinoids as one of the primary contributing factors behind pollinator decline.[72]

In April 2013, the award-winning science reporter Bjørn Vassnes weighed in on the issue, stating that "research indicates that neonicotinoids may be one of the most important factors behind the alarming decline in bee and bumblebee populations in recent years," before discussing why Germany and the United Kingdom proved so reticent to permit a ban on the substances in question.[73]

In the summer of 2013, a bee researcher was quoted as saying that

> Since the 1990s, pesticides containing neonicotinoids have replaced products based on DDT, since DDT proved to be toxic to both humans and animals. But this spring, groundbreaking studies proved – with a high degree of probability – that neonicotinoids are acutely toxic to bees.[74]

[69] Aftenposten and a number of other newspapers also reported on the initial finding that neonicotinoids may have contributed to the global decline in pollinator populations. See e.g. Aftenposten 06.01.2012 Nytt funn kan forklare hvorfor bier dør i hopetall 31.03.2012 Sprøytemidler reduserer antallet nye dronninger med opptil 85 prosent

[70] See Krupke et al. (2012).

[71] Klassekampen 19.01.2012, Er biedøden endelig oppklart?

[72] Nationen 25.04.2012, Sprøytemidler dreper honningbiene

[73] Klassekampen 11.04.2013, EU-kamp om bier

[74] Klassekampen 28.06.2013, På biejakt i massedødens tid

When the EU implemented its ban on the three neonicotinoids for outdoor use, Klassekampen noted that neonicotinoids "harm the nervous systems of the bees", and that they will nonetheless be permitted for indoor use in Norway.[75] In his essay *Another Silent Spring*, originally printed in The Guardian, George Monbiot argued that we know more than enough to introduce a complete ban on neonicotinoids. According to Monbiot, neonicotinoids are not only harmful to bees; a study published in Nature indicates that birds, too, are affected by the loss of entomofauna caused by the substances.[76] Monbiot acknowledges that we do not know with absolute certainty that neonicotinoids play an integral role in the complex of causal factors behind pollinator decline, let alone their precise contribution. Yet, he argues, we know more than enough to act given the gravity of the threat. Here, Monbiot makes a strong plea for precaution, without explicitly referring to the precautionary principle.

In 2018, Klassekampen published a longer piece from their Danish sister paper, Information.[77] In it, Jørgen Steen Nielsen introduces us to the catastrophic impact that a complete pollinator collapse would have caused, before providing a quick tour through the life of the bee and the science of pollinator decline.[8] While the article argues that there are a host of factors – known and unknown – that jointly contribute to pollinator decline, the author nonetheless posits that pesticides likely play an important role in the story. In Nielsen's hand, the studies are used to build a case for precaution, and to interrogate the Danish stance on the regulation of neonicotinoids. The Danish Environmental Protection Authority, the author contends, has been too permissive in granting exemptions from the EU-wide ban. Partly because the Authority reasons that "(i)n Denmark, we have not seen examples of bees being adversely affected by the use of neonicotinoids." Danish bees, however, are definitely under some duress, and their numbers have been in continuous decline for years. Why are Danish environmental authorities dismissive of the notion that neonicotinoids are a contributing factor? As the author notes: "The problem is that the bees' vulnerability must be understood in light of a number of stressors, where the effect of a single factor can be difficult to document." The author goes on to discuss the problem of carrying out field experiments on the impact of neonicotinoids, in a situation where control groups are very hard to come by: most European bees have, to some degree, been

[75] Klassekampen 04.12.2013, Giftforbud skal bremse biedød
[76] Klassekampen 01.09.2014, En ny taus vår?
[77] Klassekampen 27.01.2018, Bienes siste stikk

contaminated by neonicotinoids. While the article does not include an explicit plea for the exercise of the precautionary principle, it should be read as a plea for precaution in the face of uncertainty.[78]

In April 2012, Nationen reported on an American study which indicated that imidacloprid (a widely used neonicotinoid) is one of the principal causes of colony collapse disorder (CCD). Quoting a press release from the U.S. Department of Environmental Health, the news report states that "(…) the new results provide convincing and novel information on the association between imidacloprid and CCD."[79] Nationen also wrote quite extensively on the process to ban select neonicotinoids for outdoor use in the EU.[80] In February 2013, Nationen reported that imidacloprid was used on Norwegian potatoes, and reported on a Norwegian study on the impact of imidacloprid on bees. In the article, Nationen spoke to the Norwegian Food Safety Authority, the body responsible for the assessment and approval of plant protection products in Norway. The Authority's response is worth quoting at length, in so far as it exemplifies a tacit use of the precautionary principle that is not captured by simple search terms:

> The Norwegian studies demonstrate that the substance (..) is transported through the plant and found in both pollen and nectar. Rapeseed is highly attractive to pollinating bees. Concentration of the substance approaches the levels found internationally and lies somewhat below the threshold levels that the European Union's Food Safety Agency considers chronically toxic or fatal to bees. But the Norwegian Food Safety Authority argues that the threshold levels do not acknowledge the margin of error ("uncertainty margin"). We also lack guidelines for toxicity levels that are sub-lethal, yet highly adverse to bees, says senior advisor Marit Randall at the Food Safety Authority. The FSA cannot preclude that the substance raises the risk of bee deaths or colony collapse in Norway.[81]

The above quote does not make explicit reference to the precautionary principle, but the discussion is very much in the spirit of precaution. Indeed, the NFSA is implicitly accusing the EFSA of not acting in accordance with it. In a follow-up report on the Norwegian study, the lead researcher behind the Norwegian study states that "(w)e have tended to think that the toxins do

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[78] ibid
[79] Nationen 06.04.2012, Imidakloprid i sprøytemiddel pekes ut som skyldig i biedød
[80] Nationen 05.02.2013, Kommisjonen til kamp mot biedød, and Nationen 19.02.2013, Møte om insektmidler *and* Nationen 20.03.2013, Sprøyter videre til tross for advarsler *and* Nationen 02.05.2013, Sprøytemidler forbudt i EU
[81] Nationen 04.01.2013, Plantevernmiddel som kan ta livet av bier brukes i Norge

not contaminate the pollen or the nectar, but it is important to study this more closely. We know that imidacloprid is immensely toxic to bees, it is a real killer."[82]

Throughout its coverage of neonicotinoids, Nationen has tried to stay abreast of scientific studies on the relationship between neonicotinoids and pollinator decline. They reported on the impact of neonicotinoids on species higher up the food chain. In July 2014, Nationen quoted a Dutch study, which shows that birds too are affected by the use of neonicotinoids. "The birds feed their offspring with insects, and the Dutch researchers say that in areas where imidacloprid is used intensively, bird populations have declined by 3.5 per cent per year."[83]A Norwegian ornithologist added that "... high concentrations of neonicotinoids can harm the bird directly by affecting their nervous system."[84] In a separate article, the paper reported that a study showed that neonicotinoids affects sperm quality in bees, and thus their reproductive capacity.[85]

In May 2015, Nationen published an article that leaned heavily on a previous report in The Guardian.[86] Both newspapers refer to a study conducted by researchers at the University of Maryland.[87] In order to detect significant harm, the researchers found that bees had to be exposed to imidacloprid in excess of four times field-realistic levels, and for twelve weeks. In Nationen, a representative of Syngenta is quoted as saying that

> It concerns us that science is being used in a very selective manner and groups, like the International Union for Conservation of Nature, are bringing together scientists on a campaigning basis to create studies that are reported as being definitive but are extremely weak from a scientific point of view, in our opinion.

The Syngenta representative also points out that pollinator decline is a "complicated, multifactorial issue". Neonicotinoids are not the only driver. A Norwegian researcher, who has contributed to several studies of the drivers of pollinator decline, largely concurs:

> In Europe, pollinator decline can be explained by (…) larger agricultural units that are intensively cultivated, smaller pollinator habitats and a reduction in flowering crops. Climate change comes

[82] Nationen 13.02.2013, Økologisk Norge krever forbud mot plantemidler som dreper bier
[83] Nationen 28.07.2014, Dreper både bier og fugl
[84] ibid
[85] Nationen 27.07.2016, Studie – Insektmidler skader biesperm
[86] The Guardian 19.03.2015, Who is winning the PR battle over neonicotinoids?
[87] Nationen 25.03.2015, Kamp om sprøytemidler og massedød av bier

> into it as well. To top it off, we have pesticides, and they are unlikely to make a positive contribution.[88]

In an opinion piece from July 2017, Øystein Heggdal contends that a ban on neonicotinoids "will not help the bees".[89] The reasoning is that the science behind the ban has failed to indicate that neonicotinoids are a contributing factor behind pollinator decline. The link between neonicotinoids is a political artefact and not a scientific fact. At the "height of colony collapse hysteria", Heggdal argues, the EU introduced a set of "insanely rigid" rules on the conduct of field experiments on bees. As a result, almost all extant field experiments were discarded as irrelevant, and the European Food Safety Administration were left with a few laboratory studies which indicated that neonicotinoids could be harmful to pollinators. By way of example, he goes on to discuss a large-scale field experiment conducted by Centre for Ecology and Hydrology. Although the study was widely received as supportive of the contention that neonicotinoids may be harmful to bees, Heggdal contends that newspaper headlines might as well have read "Neonicotinoids make bees healthier." Heggdal's position on the issue is deviant to say the least,[90] and the opinion piece went unanswered.

In January 2017, Nationen reported on the publication of two meta-studies funded by Greenpeace and Bayer and Syngenta, respectively.[91] Where the former (based on hundreds of studies published since 2013) indicated that neonicotinoid usage is harmful to bees, bumblebees, butterflies, aquatic insects and birds, the latter synthesizes 13 studies that investigate the economic fallout of the neonicotinoid ban. Although the news report can be said to illustrate that there is some disagreement on the usefulness of neonicotinoid ban, the report primarily suggests that environmentalists and the industry rely on different concepts of risks, benefits and modes of scientific analysis. In March 2018, Nationen reported on the publication of an EFSA-authored scientific assessment of the impact of Neonicotinoids on bees, the first since the original report in 2013. Under a headline that can be crudely translated to *Fatal to bees*, EFSA expert José

[88] Nationen 25.03.2015, Tar sprøytemidler i forsvar
[89] Nationen 12.07.2017, "Forbud hjelper ikke biene"
[90] Some industry-funded social scientists have taken a similar position on the issue, e.g. Löfstedt (2013).
[91] Nationen 17.01.2017, EU gjør ikke nok for å stoppe biedød

Tarazona is quoted as saying "All in all we have confirmed that they pose a risk to the three types of bees we considered (bumblebees, wild bees and honeybees)."[92]

While Nationen acknowledge that the neonicotinoid ban is controversial and also premised on both scientific uncertainty and disagreement, the controversy is not really framed as a question of precaution. Recall that this is a newspaper that makes extensive use of the term in its coverage of other potential threats to food safety, human health and the environment. Nationen mentions that Bayer and Syngenta considered EFSA's first report on neonicotinoids and bee death to be scientifically unsound. They also contrast the contention that neonicotinoids have harmful environmental effects to Bayer and Syngenta's cost-benefit approach to the issue. On the pages of Nationen, Bayer and Syngenta's appeal to science seems to be largely construed of an opportunistic and interested plea for non-regulation, and part of a broader campaign to dissuade regulators from limiting their business opportunities. "Bayer pay hundreds of thousands for an advertisement campaign designed to trick us into believing that they are on the side of farmers and bees. But that runs contrary to their business model", a German farmer is later quoted as saying.[93] To the journalists in Nationen, research does not merely indicate that neonicotinoids may potentially be one among an unknown number of contributing factors behind pollinator decline. Available research indicates that neonicotinoids are potentially very harmful to bees, and consequently need to be banned.

4.3. The Førdefjorden case - an initial assessment of the news coverage

As stated above, the purported tension between the precautionary principle and innovation and scientific discovery can be considered a case of a more general tension between environmental conservation and capitalist expansion and exploitation. Indeed, the precautionary principle is intended to balance the odds in favor of nature by obliging decision makers to account for *potential* adverse consequences of human activities. The Førdefjorden case is a classic instance of conflict between conservational and broader environmental concerns on the one hand *and* socio-economic interest on the other. The case concerns the planned introduction of a rutile mine

[92] Nationen 01.03.2018, Tar knekken på biene
[93] Nationen 23.06.2018, Monsanto forsvinner

in the Engebø mountain in Norway and plans to construct a marine waste disposal tip in the nearby Førdefjord. In the case, Norwegian newspapers focused heavily on emergent disagreements between different research institutions and expert communities. To an extent, the coverage emphasizes the inherent uncertainty involved in predicting the consequences of large-scale interventions in a marine environment specifically, but also into nature more generally. Although the news coverage is ripe with disagreements, uncertainty and ambiguity, the precautionary principle does not play a leading role in the newspaper coverage of the debacle.[94] It did, however, play an important supporting role in the prolonged and messy decision-making process.[95] When precaution appears to take the backseat in the overall narrative of the Førdefjord, it is because the story can – and should – be framed as a question of how environmental values should be balanced against other and primarily economic societal concerns.

4.3.1 A quick tour of the case

In 2007, Førdefjorden was designated a national "salmon fjord" and therefore accorded special protection under the law. A year later, Nordic Mining applied for a permit to extract rutile from the Engebø mountain in Western Norway, and for a second permit to establish a tailing disposal site in the neighbouring Førdefjord. It was immediately evident that the proposed intervention would prove controversial.[96] In support of the application, and in accordance with the requirements of the Planning and Building Act, Nordic Mining prepared an impact assessment of the consequences of the intervention in the Førdefjord. Many of the early news reports focus on disagreements between scientific communities, particularly between the Institute for Marine Research (IMR) and the Norwegian Institute for Water Research (NIVA), one of the contributors to the impact assessment. Where NIVA had highlighted some risks involved in the planned disposal, their report largely condoned the disposal of waste in the Førdefjord. Representatives of the IMR argued – both in their advisory statements, and in the media – that the impact

[94] Thus, for instance, the regional daily Bergens Tidende referred to Nordic Mining 181 times between 2009 and 2020, Nationen 83 and Klassekampen 58 times. Throughout the coverage of the Førdefjord, the same papers referred to the precautionary principle 8, 4 and 2 times, respectively.
[95] See Elisabeth Schøyen Jensen (2016).
[96] See Bergens Tidende 28.03.2009, Ei bygd med ein prislapp?

assessment had not taken sufficient heed of the vulnerability and ecological significance of the fjord in question. From Bergens Tidende, Aftenposten's sister paper in Western Norway:

> The experts disagree on the risks involved in a marine waste disposal. The Norwegian Institute for Water Research (NIVA) vouches for the method. But marine biologist Jan Helge Fosså characterizes it as one of the most severe interventions into a Norwegian fjord ever. He thinks that the dumping will have grave consequences in a fjord that is designated as a national salmon fjord.[97]

In their consultative letter, the IMR argued that the empirical basis of the impact assessment was weak on crucial counts and that the consequences of the proposed intervention remained highly uncertain and potentially very harmful to life in the fjord. The letter also sought to remind decision makers that identified uncertainties more than suggested that the precautionary principle was called for.

The disagreement between the scientific communities became a focal point for media coverage of the case. In August 2010, Bergens Tidende published a news report on a public meeting on the waste management plan.[98] During the meeting, a researcher from Niva stated that "I find it hard to see that it will have a big impact. Yes, the intervention is big. But so is the fjord". One of his colleagues contended that although particles from the disposal site *may* contaminate the fjord "(...) it will happen late, and concentrations will remain small. Outside the disposal site, concentrations from the deposit will be so low as to exert no effects on marine organisms. Moreover, fish can withstand large quantities of particles." Jan Fosså of the IMR retorted that "None of NIVA's modelling exercises are relevant. (…) NIVA cannot draw these conclusions; among other shortcomings, they lack data on wind conditions and currents in the fjord."[99] In the news report, a representative of the municipality contended that the IMR had not documented their objections to the planned intervention, implying that their final decision would be based on NIVA's conclusions.[100]

In October 2010, the IMR wrote a new consultative letter, advising strongly against the proposed intervention, while highlighting key uncertainties left unaddressed by the impact

[97] Bergens Tidende 16.09.2009, Vil driva gruve i 55 år
[98] Bergens Tidende 31.08.2010, Rykande usamde om dumping i sjø
[99] ibid
[100] ibid

assessment. In the letter, the Institute warned that the planned tailing disposal could serve to destabilize fjord's ecosystem, and adversely affect a number of "red listed" (particularly vulnerable) species in the fjord. On the basis of the Institute's advice, the Directorate of Fisheries lodged a formal objection to the proposed intervention. The plan was nonetheless approved by the responsible municipalities. As a result of the formal objection, however, the case was sent to the State Administrator's office for arbitration. When arbitration failed, responsibility for the plan was transferred from the municipalities to the Ministry of Environmental Protection. The ministry, in turn, requested advisory statements from the Directorate of Nature Management (DN) and the Climate and Pollution Agency (Klif).

While the issue was under treatment in DN and Klif, the IMR wrote a new letter to the Ministry of Environmental Protection advising against the disposal of waste in the Førdefjord. In it, the Institute formally accused NIVA of having exaggerated the scientific basis of their conclusions, and – consequently – of having understated the potential risk for cods, other species of fish and corals in the fjord, and for salmon in tributary rivers. The following passage is worth quoting at length

> HI considers that it is not possible to conclude that the mining waste "with a high degree of predictability" will remain in the marine waste disposal site. This conclusion is drawn on erroneous premises. HI also disagrees with Niva's conclusion that the concentration of particles (…) will not impede on any of the life-stages of the coastal cod. The effects of prolonged exposure to mining particles have not been subject to scientific research.[101]

The news report highlights numerous other key uncertainties left unresolved by the risk assessment and concludes by quoting the IMR's stance on the issue: "(…) when the effects of an intervention are uncertain, we have to proceed on the basis of the precautionary principle."[102] The IMR had once more moved beyond the provision of scientific advice; the institute also sought to provide legal counsel on the letter of the law to the Ministry responsible for the law in question (the Nature Diversity Act). A week later, Nationen reported that both the Climate and Pollution Agency (Klif) and the Directorate for Nature Management (DN) had assessed the Directorate of Fisheries' objections to the planned waste deposit and concluded that the potential

[101] Klassekampen 12.03.2012, Strid om gruveavfall
[102] ibid

consequences of the intervention had not been adequately investigated. In the news report, the director of Klif is quoted as saying that

> In a case this big, this important and with such long-term consequences, strongly opposed interests and scientific disagreement, the precautionary principle must apply; uncertainties must be reduced as much as possible.[103]

Klif's statement should be interpreted to read that prevailing uncertainties *could* be reduced, given enough time and resources. The news report goes on to outline Klif's suggestions on how key uncertainties can be remedied through further inquiries. In their news item on the decisions, Klassekampen quoted DN's conclusions:

> There is a risk that the ecosystem will suffer significant deterioration. Given the vast uncertainty on the consequences, DN attaches great weight to the precautionary principle in the Act on biodiversity. The directorate therefore agrees with the IMR's objection to the intervention.[104]

Based on the advice of the two agencies, the Ministry of Environmental Protection requested that Nordic Mining conduct a series of supplementary inquiries into the potential impact of waste disposal in the Førdefjord.[105] In a letter to Nordic Mining, the Ministry provided a list of questions that needed to be subject to further investigation, including questions pertaining to the spread of particles in the fjord, and broader consequences for marine biodiversity. The additional studies were conducted between August 2013 and August 2014.

Once the additional studies had been made available, the Directorate of Fisheries – the agency that had levied the objection that initiated the process – requested that the IMR evaluate the new studies. The IMR's conclusions were widely cited in the media. In their conclusions, the IMR argued that the supplementary studies tended to "... underestimate the fjord's significance for fish, underestimate the impact of particles on fish, underestimate the biodiversity of the fjord, and based on methods that are frequently not suited to draw any conclusions whatsoever".[106] Nordic Mining had engaged Det Norske Veritas (DNV) to conduct an analysis of the environmental risks of depositing mining waste in the fjord. In their reported, DNV concluded

[103] Nationen 19.03.2012, Klif og DN vil utsette gruvedrift ved Førdefjorden
[104] Klassekampen 20.03.2012, Advarer mot gruvedrift ved Førdefjorden
[105] ibid
[106] Klassekampen 29.11.2014, Anklager forskere

that the intervention would exert a negligible effect on life in the fjord. This conclusion was seized upon by the IMR, who characterized the report as both "amateurish" and "imprecise". According to the Institute, the proposed intervention represented a "significant and durable pollution of the Førdefjord", and an "unsustainable use of the fjord". A representative of the Norwegian mining industry (Norsk Bergindustri) retorted that "(…) the IMR are seeking to halt the project and are working strategically towards that end. The IMR has sided with the environmentalists. They are neither objective nor scientific."[107] Some weeks later, investors behind the proposed intervention called for a partiality assessment of Jan Helge Fosså of the IMR. Fosså, they argued, had a personal agenda, and had abandoned impartial expertise in favor of environmental activism.[108] Industry representatives expressed sympathy with the investors, contending that the IMR had exceeded their mandate by warning so forcefully against the plan.[109]Meanwhile, the Directorate for Nature Management had assessed the new studies and sent their conclusions to the Ministry of Environment Protection. In their letter, the Directorate argued that the supplementary studies had indeed contributed to a significant reduction in uncertainty. The law's requirement that potentially harmful interventions be based on a comprehensive summary of available scientific research had been fulfilled.[110] Nonetheless, key uncertainties remained, not least regarding the potential impact on four "red listed" (particularly vulnerable) fish species. In this sense, the Directorate echoed the IMR's objections. One of the fish species, the blue ling, had a single known spawning site along the Norwegian coast: in the planned disposal site. As a result, and with reference to the conservation goals found in article 5 of the Nature Diversity Act and on basis of the precautionary principle found in article 9 of the same law, the Directorate concurred with the initial objection levied by the Directorate of Fisheries. Based on environmental considerations alone, the proposed intervention should not be permitted.[111]

In their advisory letter – and in the media – the Directorate for Nature Management emphasized that their recommendations were not based on a comprehensive balancing of conservation goals against other, perhaps equally salient societal demands. The final decision,

[107] ibid
[108] Klassekampen 29.11.2014, Anklager forskere
[109] Klassekampen 29.11.2014, Bergindustrien forstår frustrasjonen
[110] See Jensen (2016).
[111] Nationen 04.11.2014, Miljødirektoratet fraråder gruvedeponi I Førdefjorden

the Directorate contended, would be left to political decision-makers and premised on a difficult balancing act between environmental concerns, the stated goals of the Biodiversity Act and the precautionary principle on the one hand, and broader socio-economic concerns on the other. This balancing exercise – they emphasized – was far beyond their remit and would be subject to political deliberation at the hands of the Ministry of Environment Protection.[112] Somewhat curiously, the Ministry of Environment Protection did not share the Directorate's view on the division of labor between technocratic expertise and political decision-makers. Through a series of letters, the Ministry eventually instructed the Directorate to write a recommendation premised on a comprehensive weighing of environmental, economic, and other presumably contradictory concerns. The Directorate did as they were told, and in April 2015, the Ministry of Climate and the Environment announced that it had granted a permit for the disposal of mining waste in the Førdefjord.[113] Upon a closer inspection of the societal benefits of the planned intervention, the Directorate had concluded that their environmental concerns could be set aside and the planned intervention permitted.

In the aftermath of the Ministry's decision, members of the Liberal and the Christian parties accused the Cabinet of having exerted pressure on the Agency to alter their stance on the matter. One parliamentarian argued that a political decision – the balancing of environmental and economic concerns – had been needlessly foisted upon the Agency, who should have been left to assess the environmental concerns raised by the planned waste disposal.[114] As a result, the Cabinet – and particularly the Minister of Climate and the Environment – was able to mask a political decision as a purely technocratic decision. The director of the Agency, Ellen Hambro, argued that the Agency had not truly *altered* their stance, and certainly not as a result of undue political pressure. Their original recommendation was based purely on environmental concerns and had not considered other significant societal concerns. The agency's independence had not been violated.[115] Then leader of the Christian Democratic Party, Knut Arild Hareide, was not impressed:

[112] ibid
[113] Aftenposten 17.04.2015, Regjeringen sier ja til omstridt sjødeponi
[114] Nationen 07.05.2015, Måtte svare for påstand om press
[115] Bergens Tidende 11.05.2015, Miljødirektøren avviser påstand om politisk press

> I react to the Cabinet's decision to ignore the advice of environmental experts. The Cabinet should have acted in accordance with the precautionary principle and said no.

4.3.2 Why is Førdefjorden not framed in terms of precaution?

The Førdefjord debacle elicited a sprawling and durable debate in Norwegian newspapers – indeed, it goes on to this day.[116] It is far beyond the scope of this report to provide a detailed exposition of the debates and the themes covered therein. Suffice to say that the case – and numerous other similar cases – led to a discussion of the guiding principles behind Norwegian environmental policy, and about the tension between environmental and conservational aims on the one hand, and broader political and socio-economic aims on the other. It did not – however – elicit debate on the place of the precautionary principle in Norwegian environmental policy generally, nor in the management of biodiversity specifically. This is slightly curious, in so far as the Førdefjord case could be considered a test-run of the precautionary principle – as enshrined in Section 9 of the Nature Diversity Act – in action. Why did the debate fail to elicit a broader discussion, or even acknowledgement of the precautionary principle in Norwegian public discourse? To my mind, and although reporters devoted much space to scientific disagreements, the case was never truly treated as an instance of scientific uncertainty or ambiguity. The case is <u>really</u> about Norwegian environmental policy more broadly, and specifically about the weighting of environmental legislation and conservation policy goals against business interest.

Once Nordic Mining had made their intentions clear, and several environmental organizations sounded the alarm and prepared to fight the plans, a commentator in the leading regional paper in Western Norway wrote

> Yet again, we are faced with this eternal question: Which natural, environmental and human interests must be sacrificed in order for a commercial actor to extract and profit on our mountains, valleys, oceans and fjords?[117]

In the media, and among many of the participants, the precautionary principle was considered a sideshow, or at the very least subordinate to this "eternal question".

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[116] Får tillatelse til gruveprosjekt i Sunnfjord (bt.no)

[117] Bergens Tidende 28.03.2009, Ei bygd med ein prislapp

Summary discussion of the qualitative deep dives

In this report, I have selected three contentious issues, all of which fall squarely within the ambit of the precautionary principle, and two of which have elicited sprawling and long-lasting debates on the precautionary principle internationally.[118] As we have seen, the issue of neonicotinoids and pollinator services received some newspaper coverage in Norwegian newspapers. Two Norwegian newspapers wrote fairly extensively on emerging signs of the harmful effects of systemic pesticides, and on the EU's regulatory process.[119] Both papers largely failed to couch the issue in terms of precaution; rather, the prevailing frame appears to have been the conflict between the short-term economic fortunes of oligopolistic multinational corporations on the one hand and the ecological basis of human societies on the other.[120] Reading Norwegian newspapers, we are given little reason to believe that the issue of neonicotinoids is a "wicked problem".[121] Although the science behind the neonicotinoid ban is incomplete and replete with uncertainties,[122] few Norwegian contributions have sought to problematize the EU's regulatory stance with reference to the knowledge basis of its policy.[123] If the issue can be said to be characterized by epistemic controversies and disagreements, the conflict is between business interest on the one hand, and independent scientists *and* environmental organizations on the other. Unlike Denmark, where sugar beet farmers rely heavily on exemptions from the EU's ban on the outdoor use of neonicotinoids,[124] Norwegian farmers appear not to have been adversely affected by the ban. This may serve as a partial explanation of why the neonicotinoid ban has failed to inspire much controversy in Norway.

The coverage of the Førdefjorden debacle is also largely framed as a conflict between business interest and nature conservation. Although the precautionary principle played a pivotal

[118] See Drivdal and van der Sluijs (2020, forthcoming). See e.g. EASAC (2015) on the need for re-evaluating the precautionary principle in light of the EU's failure to liberalize GMOs in light of prevailing scientific wisdom.
[119] Many other Norwegian newspapers reported on both scientific reports and EU regulatory developments, albeit far more sparingly.
[120] It should be noted that both Klassekampen and Nationen have taken clear positions on the concentration of power in international food production.
[121] See Rittel and Webber (1973).
[122] Cf. Drivdal & van der Sluijs (2020).
[123] There is a lone exception.
[124] See Information 22.05.2018 Forening: Miljøstyrelsen bryder EU-direktiv, når den giver dispensation til at bruge ulovligt middel, der truer bier | Information

and even disruptive part in the politico-bureaucratic process, the principle played a supporting role in the media's narrative. Newspaper coverage did focus on disagreements between different research communities and did hint at the massive complexities and uncertainties involved in predicting the environmental impact of the planned intervention. These uncertainties, and the precautionary principle, appear to have been subsumed by a story of conflict between environmental concerns and economic development.

Concluding remarks

Although the precautionary principle is frequently invoked in Norwegian newspapers, most references to the principle are largely void of substance. Over the course of a twenty-year period, only *one* contribution has sought to discuss the precautionary principle in abstract terms.[125] That is not to say that the precautionary principle is not an important discursive device. In the recurring debates on the future of Norwegian oil exploration and extraction, the precautionary principle is generally used to signal opposition to harmful interventions in vulnerable ecosystems. It is less frequently used to draw attention to the incompleteness and massive uncertainties encountered in the risk assessment processes that underpin Norwegian decision-making processes.[126] Sometimes, it is used to signal that cabinet coalition partners with widely divergent environmental policy preferences are *actually* on the same page, or that a policy defeat is *really* a compromise or even a victory.

Generally, the precautionary principle is used to take a position on *something*, but only rarely does anyone take a stance on the precautionary principle. As we have seen, the neonicotinoids case inspired one provocateur to lambast policymakers' opportunistic and unscientific misuse of the precautionary principle.[127] Up until very recently, with the emergence of Covid-19 and attendant curtailment of personal liberties, no issue has inspired more debate on the uses and

[125] In an opinion piece, public philosopher Lars Fr. H. Svendsen warns against the perils of exaggerated precaution, pointing out that the societal costs of hard versions of the precautionary principle would be "astronomical". See Aftenposten 06.07.2006, Ikke alltid best å være føre-var.

[126] See Hauge m.fl. (2014) and Blanchard m.fl. (2013).

[127] The imposition of significant limitations on personal freedoms during the pandemic has led political commentators and some noted legal scholars to warn against the perils of precaution in general, and the precautionary principle in particular. The principle, they argue, permit decisionmakers to impose ill-founded and harmful measures without prior justification. See for instance Misbruk av føre-var prinsippet.

abuses of the precautionary principle than the European and Norwegian stances on genetically modified organisms.[128] A slate of contributors appear to argue that the precautionary principle underpins a regulatory regime that is largely premised on ignorance, misunderstandings and an unwillingness to adapt in the face of technological and scientific progress. Moreover, the regulatory regime simply does not make *sense*, and draws too sharp a distinction between GM technologies and conventional breeding techniques.[129] Two otherwise identical crops will be subject to very different assessment regimes *if* one has been brought about by so-called conventional breeding techniques, and the other through techniques covered by the Gene Technology Act. This regulatory inconsistency can be considered a remnant of a precautionary moment (the early 1990s), when the science of genetic modification had yet to reach sufficient maturity to fully embrace it. That being said, the fact that Norway is yet to accept the introduction and placement of genetically modified organisms into the environment cannot be reduced to an overly cautious and unscientific position on the ecological risks involved in genetic modification.[130] Yet, many contributors to the debate both in Norway and elsewhere continue to argue that it can.[131] At present, most if not all GMOs that have been subject to assessment have exceedingly limited utility in the Norwegian food system. With the advent of Crispr-Cas9, it is easy to imagine a slate of applications that *would* pass the test. In the wake of these technological advancements, we are likely to see a re-negotiation of the regulatory regime. To my mind, the public discussions that took us here were not very illuminating.

It is perhaps somewhat disappointing that the most vocal critics of the precautionary principle in Norway have been representatives of the sciences (e.g., plant scientists, molecular biologists and biostatisticians), and not Big Oil or Big Tobacco or Big Chemicals. In Norway, a number of researchers working in the fields of genetic modification and new breeding techniques have not only sought to press for a liberalization of the rules governing the insertion of genetically modified organisms into the environment. Many of them have also suggested that precautionary measures need to be subjected to a stricter proportionality test generally, and one that would

[128] For an early discussion see Tait (2001).
[129] See e.g. Aftenposten 13.11.2014, Vi kan ikke si nei til genmodifisert mat.
[130] It can, perhaps, be reduced to an unwillingness on part of some agrobusinesses to shoulder the burden of traversing an approval procedure that is -- by all accounts -- arduous, time-consuming and economically risky. See Bondebladet on the promise of a dry-rot resistant potato.
[131] See Pfotenhauer et al. (2019) for a recent discussion on the so-called ”knowledge deficit model” of GMO resistance.

surely weaken it. To my mind, these suggestions are legally and politically naïve, but some prominent legal professionals appear to disagree. Moreover, the engagements appear to overstate the role of the precautionary principle in the assessment of GMOs, and in sustaining a regulatory regime that – in general – must be said to be skewed against modern gene technologies in food production.

The precautionary principle is not *one thing.* The precautionary principle encountered by environmentalists in the Fjørdefjord is not identical to the precautionary principle encountered by proponents of GMOs and new breeding techniques, nor with the precautionary approach encountered by fishermen dissatisfied with Norwegian marine resource management policy. The legal and scientific contexts are widely divergent, and the principle has come to mean different things across different regulatory domains. Engagements with the principle tend to fail to acknowledge this.

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