

Cross-Border Impact Assessment 2019

Student Dossier 6: Cross-border effects of the EU Nitrates Directive and manure quotas between the Netherlands and Germany



The Institute for Transnational and Euregional cross border cooperation and Mobility / ITEM is the pivot of research, counselling, knowledge exchange and training activities with regard to cross-border mobility and cooperation.

Maastricht University

Cross-Border Impact Assessment 2019

Student Dossier 6: Cross-Border Effects of the EU Nitrates Directive and Manure Quotas
between the Netherlands and Germany

Jurian van Beusekom
Youri Cremers
Jenny Franke
Enrico Wegner
Zuzanna Zmuda

The *Institute for Transnational and Euregional cross-border cooperation and Mobility / ITEM* is the pivot of scientific research, counselling, knowledge exchange, and training activities with regards to cross-border cooperation and mobility.

ITEM is an initiative of Maastricht University (UM), the Dutch Centre of Expertise on Demographic Changes (NEIMED), Zuyd University of Applied Sciences, the City of Maastricht, the Euregio Meuse-Rhine (EMR), and the Dutch Province of Limburg.



Table of Contents

1. Introduction	3
2. Objectives, Methods and Area.....	3
2.1 Framework	3
2.2 Demarcation.....	3
2.3 Research themes, principles, benchmarks, and indicators.....	4
2.3.1 European integration	4
2.3.2 Sustainable socio-economic development	5
2.4 Omitted theme: Euregional cohesion	5
3. Legal Background	6
3.1 Legal basis in the Treaty.....	7
3.2 The Nitrates Directive within the EU framework.....	7
3.3 The Nitrates Directive in general	8
3.3.1 Nature of the Nitrates Directive	8
3.3.2 Why a Nitrates Directive?	8
3.3.4 The Nitrates Directive: an overview.....	9
3.4 Implementation of the Directive and infringement procedures	10
3.4.1 Netherlands.....	10
3.4.2 Germany.....	12
4. Environmental Problems due to Agricultural Practices in the Border Region; Implementation Problems?	13
4.1 The Impact on Soil in Agricultural Areas	13
4.2 The Impact on Groundwater in Agricultural Areas	14
5. Economic Impact of the Nitrates Directive	19
5.1 Manure Disposers	19
5.2 Exports/Imports	20
5.3 Fraud	21
6. Policy Recommendations.....	23
7. Conclusion.....	23
8. Appendices.....	25
9. List of References	28

1. Introduction

On June 21, 2018 the Court of Justice of the European Union (CJEU) ruled that Germany had violated EU laws regulating the nitrates usage in the agricultural sector (DW, 2018). Although nitrates are an essential part for growing plants successfully and efficiently, they also represent a danger to human health, the environment, and sustainable agriculture. Due to these risks, the Nitrates Directive was introduced which has the goal to limit the nitrates usage in the agricultural sector. Member States were then responsible to implement laws following the Nitrates Directive. These laws can by nature differ in their implementation, the enforcement, and their effectiveness in guaranteeing a sustainable usage of nitrates. They will therefore also cause different incentives for farmers and other agricultural firms to commit illegal activities endangering the goals of the Nitrates Directive. News of such fraud and general problems of enforcing the laws in the Dutch-German border region have appeared multiple times in recent months (Dohmen, 2017b). Therefore, this report aims to analyse the effects of the Nitrates Directive on the Dutch-German border regions and the potential implications for manure fraud.

2. Objectives, Methods and Area

2.1 Framework

As the first version of the EU Nitrates Directive was published in 1991, this dossier is an ex-post assessment of the effects of this policy. Specifically, this paper focuses on the effects on cross-border regions, as they face more complicated challenges with regards to legislation and cooperation with neighbour countries. However, it is important to notice the dynamic state of agricultural and environmental legislation. Therefore, this paper additionally gives an insight in the effect of more recent national policy developments.

2.2 Demarcation

As figure 2.1 below shows, the definition of the Euregion differs. For this report, the relevant cross-border region will be defined as Euregion Rhine-Meuse-North (yellow). This area encompasses the Northern part of the Dutch province of Limburg and the Western part of the German state of North Rhine-Westphalia. Although the 'official' definitions of this Euregion do not include the Dutch province of North-Brabant, this report does choose to include the East part of this province.

The choice for this specific focal area is based on two main pieces of information. Firstly, the described regions in the Dutch part of this cross-border area are the main agricultural hotspots of the Netherlands (CBS, 2019), something which is also supported by the location of most manure intermediary firms (RVO, 2019c). Secondly, the incentives for manure fraud in the defined Dutch area and the effects of this on the environment of the chosen German area are the largest in these respective areas. This can be verified using the map of the Dutch Ministry of Agriculture (Appendix A), as well as the map produced by the Dutch newspaper NRC (Dohmen & Rosenberg, 2017a).

Figure 2.1: Map of different Euregions in the Belgian-Dutch-German border area.
Source: Ministerie BZK 2018.



2.3 Research themes, principles, benchmarks, and indicators

In order to cover the cross-border effects, this report discusses two main themes (out of three described by the ITEM cross-border impact assessment approach): *European integration* and *Sustainable & socio-economic development*. These themes are both characterised by legal and political provisions in the European environment that provide certain benchmarks for the optimal situation in Europe to compare the current situation to. This comparison is made possible with indicators. All of these are summarised in table 1 below. The remaining part of this section will further elaborate on this table. Moreover, section 2.4 will explain the reasons behind the omission of the third common research theme in the cross-border impact assessment: namely, *Euregional cohesion*.

2.3.1 European integration

At the establishment of the European Union, one of its main goals was to overcome differences in law in different member states. It can be done with the help of European legal instruments such as regulations, decisions and directives. While regulations are immediately and directly enforceable, directives have to be implemented into national legislation. This means that each Member State has some discretion as to how to transpose such European laws into their domestic system. As a result, there are usually some disparities between national implementing regulations, which later may affect border regions in particular.

Table 1: Methodological overview of the research themes

Theme	Principles	Benchmark	Indicators
European integration	Article 191 TFEU Nitrates Directive National implementation of the directive	Standards of the Nitrates Directive Harmonized laws Effective enforcement	Legal analysis of EU Treaties, EU Directives, and national law
Sustainable socio-economic development	Sustainable agriculture Criminal/Economical	Decrease in environmental damage Prevention of fraud	Soil quality Water quality Nitrate pollution Production of manure Export

It is common for EU environmental legislation, such as the codification of nitrates levels in the environment, to take the form of a directive to allow for national discretion in their implementation. As a basis for comparison of the current situation in the (euregional) usage of nitrates to these benchmarks, section 3 of this dossier will provide an extensive legal analysis of the different European treaties, directives, and national laws.

2.3.2 Sustainable socio-economic development

An obvious principle to look at in the light of sustainable socio-economic development is the status of sustainable agriculture in the relevant cross-border region. Section 4 of this report will analyse available data and information on soil and water quality in order to estimate the potential pollution due to nitrates. Section 5 will continue by discussing the economic background, looking at exports and the drivers of the manure market, which will help to identify the reasons behind and the effects of the illegal disposal of manure.

2.4 Omitted theme: Euregional cohesion

As section 5.3 will further elaborate, it is very difficult to obtain information about a topic as sensitive as fraud. Both the Dutch and the German government have made statements in which they disapprove of illegal operations surrounding manure disposal (Ministerie LNV, 2018 & Heinen-Esser, 2018). However, these statements remain informal and do not provide useful information on the amount of cooperation between the two countries (Kreis Viersen, 2018). It was established that the Netherlands and the German states of North Rhine-Westphalia and Lower-Saxony have a Memorandum of Understanding (Ministerie LNV, 2018), in which one of the points addresses the illegal disposal of manure cross-border. Action point 12 reads as follows:

'The mutual exchange of information and the further joint set-up of supervision on cross-border manure transports should be continued on a trilateral basis (NL-NRW-LS).' [Own translation] (Eerste Kamer, 2015, p. 6)¹

¹ Source: <https://zoek.officielebekendmakingen.nl/blg-457686.pdf>.

Since the activation of the MoU in 2011, the parties have reported successful efforts to cooperate, mentioning in particular the exchange of detailed data on cross-border transports of manure (Eerste Kamer, 2015). However, information about the situation since 2015 is lacking.

Furthermore, it was not possible to conduct research among farmers or agricultural organisations for multiple reasons. Firstly, the previously mentioned sensitivity of the topic prevented the team from having contact in the first place, or using information that was informally exchanged. Secondly, the regional municipalities (in the Netherlands) referred (rightly) to the national organisations, which did not provide any further information. Therefore, it is important to refer to existing research by Wageningen University that investigated farmer's opinion on the recent (more stringent) rules on manure disposal (Lauwere, 2016): This study concluded that there was a negative attitude among farmers towards the regulation on the treatment of nitrate (and manure related practices), based on the Dutch legislation a 4.7/10. However, in the context of this dossier, Lauwere's findings are only of limited value, given their lack of coverage of farmers' attitudes towards the cross-border problems (instead focussing more on internal factors and the disposal within the borders of the Netherlands).

In view of these sensitivities and limitations, the team decided not to include the theme of Euregional cohesion in this dossier. Consequently, this leaves room for future research to explore further the attitudes of farmers from the two countries towards with regard to nitrate related cross-border issues.

3. Legal Background

In order to better understand the Nitrates Directive (91/676/ECC)² and the policy reasons behind it, one has to analyse the foundations on which it was built (the Treaty of European Union and the Treaty on the Functioning of European Union) and the broader legal framework in which it is functioning.

The European Union derives its powers from the Member States. The competences and the spectrum of its powers are delimited in the Treaties. According to Article 2 of the Treaty on the Functioning of the European Union (TFEU), there are three different categories of competences that the Union can have: exclusive, shared and supporting. Environment falls under the shared competences under Article 4(2)(e). It means that the Member States can legislate in the given field as long as the Union did not do it or does not plan to do so. In practice, it is a matter of the importance of the issue and which 'level' is more suitable to regulate it (principle of subsidiarity). If it is manifested that the problem is substantial and necessary to tackle on European level by introducing EU legislation which is binding upon all the Member States, then the Member States should refrain from introducing their own national legislation.

Therefore, since the competences are shared, there was in principle no immediate obligation from the side of the European Union to regulate this issue. Nevertheless, the reason why the European Union decided to act in this area was because of the (enduringly) high nitrogen pollution of waters throughout its Member States. As with many environmental problems, water sources are not restricted within national boundaries, therefore, an EU-wide approach has been crucial to tackling problems of pollution (EC, 2010). As a residual product of livestock farming, manure is a rich source in

² Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources (the Nitrates Directive).

nitrites. Since these nutrients are useful to (re)nourish agricultural grounds, manure is a popular field fertilizer among farmers. Importantly, though, an overuse of nitrates is also known to have a negative impact on the biological life of water, as well as the health of animals and people using it for drinking. They represent a health risk because they bind with haemoglobin and thus prevents the transport of oxygen in the body. Research shows that nitrates and nitrites are also conducive to the formation of nitrosamines that may induce cancer: notably, in liver, colon, lung, pancreas as well as the stomach. They also have mutagenic properties (Ma et. al., 2018).

3.1 Legal basis in the Treaty

Accordingly, the Nitrates Directive forms a part of a comprehensive framework of the EU's legislation to protect the environment and to further regulate (industrial) agriculture.

According to Article 191(1) TFEU, the environmental policy of the European Union has as its objectives to preserve, protect and improve the quality of environment, protect human health, ensure rational utilisation of natural resources and promote measures at international level to deal with regional or worldwide environmental problems. Moreover, according to Article 191(2) TFEU, the policy has to take into consideration differences between regions in the EU and should have preventive character.

3.2 The Nitrates Directive within the EU framework

Therefore, the Directive is a tool to fulfil those environmental aims as outlined in the Treaty, either directly or indirectly. The Directive itself has also close links with EU policy activities concerning water, air, climate change and agriculture and its implementation is meant to yield benefits in all these areas. Several legal instruments are connected to it.

On the one hand, the reduction of nitrates is also one of the main goals of EU Water Framework Directive (2000/60/EC),³ which addresses pollution from urban waste waters and agriculture. It establishes a comprehensive, cross-border approach to water protection organized around river basin districts as elaborated upon in its preamble. In addition, the Groundwater Directive (2006/118/EC)⁴, under Article 1, establishes a regime which sets groundwater quality standards and introduces measures to prevent or limit inputs of pollutants into groundwater. It complements the Water Framework, as it requires assessments on the chemical status of groundwater and the identification and reversal of significant and sustained upward trends in pollutant concentrations (EC, 2010).

On the other hand, there is the Common Agricultural Policy (CAP). It is based on three fundamental principles: market unity, Community preference and financial solidarity. It broadly aims to: support farmers and improve agricultural productivity, ensuring a stable supply of affordable food, safeguard EU farmers to make a reasonable living, help tackle climate change and the sustainable management of natural resources, maintain rural areas and landscapes across the EU, keep the rural economy alive by promoting jobs in farming, agri-foods industries and associated sectors (European Commission, n.d.). The CAP also falls within the Union's shared competences, under Article 4 (d) TFEU. Hence, Article 38(1) TFEU specifies its objectives as increasing agricultural productivity, ensuring a fair

³ Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy.

⁴ Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration.

standard of living for agricultural activities, stabilizing the market, assuring availability of suppliers and ensuring reasonable prices. Nevertheless, as every policy outlined in the Treaty, the agricultural policy must include environmental protection requirements and the EU and the Member States must adhere to them while defining and implementing their activities, in line with Article 11 TFEU. Correspondingly, the CAP backs up the Nitrates Directive through direct support and rural development measures. For example, several Member States have included nutrient management measures (such as wider buffer strips around water courses) among the agri-environmental initiatives for which farmers can receive payments. Direct support is thus subject to cross-compliance with EU environmental legislation, including the Nitrates Directive (EC, 2010).

All the examples illustrate how the Nitrates Directive provides a key link between the EU's environmental and agricultural policies and the potential tension between their objectives.

3.3 The Nitrates Directive in general

3.3.1 Nature of the Nitrates Directive

The Nitrates Directive can, as follows from the name, within the several forms of EU legislation be categorised as a *directive*. Together with the Regulations, Decisions, and Recommendations and Opinions, Directives form the corpus of secondary legislation of the EU as provided for in Article 288 TFEU, the Treaties themselves being the primary source of EU law. Directives are characterised by the fact that they are not binding in all their aspects (as opposed to Regulations and Decisions), but only as far as the result to be achieved is concerned. This means that Directives are not directly applicable and Member States must transpose the Directive into national legislation. How this is done and in which form, is generally up to the Member States.

Being a Directive, the Nitrates Directive was thus not directly applicable when it was promulgated on 19 December 1991, but for it to be applicable, it had to be implemented in national legislation. Pursuant to Article 12(1) of the Directive, the Member States had to make sure their laws, regulations and administrative provisions complied with the Directive within two years after it was notified to them, namely by December 1993.

3.3.2 Why a Nitrates Directive?

The Nitrates Directive was adopted in order to tackle the development recognised in the 1980s that the water and soil quality suffered from an increase in the use of manure from a quickly growing livestock sector (Grinsven, Tiktak & Rougoor, 2016; see also Fraters et. al., 2011). The preamble of the Directive formulates it as follows:

'it is [...] necessary, in order to protect human health and living resources and aquatic ecosystems and to safeguard other legitimate uses of water, to reduce water pollution caused or induced by nitrates from agricultural sources and to prevent further such pollution; [...] for this purpose it is important to take measures concerning the storage and the application on land of all nitrogen compounds and concerning certain land management practices.'

3.3.4 The Nitrates Directive: an overview

A. The Provisions of the Nitrates Directive

Article 1 determines the objective of the Directive is:

- reducing water pollution caused or induced by nitrates from agricultural sources and
- preventing further such pollution.

Article 2 then sets out definitions of terms used throughout the Directive. Article 3 and following provide the actual obligations. The last two Articles—Article 12 and Article 13—contain some “administrative” provisions regarding the directive’s implementation and its notification to the European Commission.

The Directive also contains five Annexes that are being referred to throughout the Directive. These appendices specify the technical details, relating to:

- The criteria that Member States should use when determining which part(s) of their territories should qualify as “vulnerable zones” and, therefore, for which part(s) of the country they will have to set up action programmes (*Annex I: Criteria for Identifying Waters Referred to in Article 3(1)*);
- Provisions that Member States *have to* (for the provisions under A) or *can* (for the provisions under B) incorporate in the code(s) of good agricultural practices they have to establish, pursuant to Article 4(1)(a), (*Annex II: Code(s) of Good Agricultural Practice*);
- A list of measures that Member States are obliged to incorporate in the action programmes they have to create, as follows from Article 5 (*Annex III: Measures to Be Included in Action Programmes as Referred to in Article 5(4)(a)*);
- The standards that should be used when measuring nitrogen compounds and nitrate concentrations (*Annex IV: Reference Methods of Measurement*); and
- The information that should be contained in the reports Member States have to submit to the European Commission pursuant to Article 10 (*Annex V: Information to be Contained in Reports to in Article 10*).

B. The Member States’ Obligations Following from the Directive

Pursuant to Article 3 of the Directive, Member States have to designate “vulnerable zones”. As follows from Article 3(2), in combination with Article 2(k), those zones refer to: “areas of land [...] which drain into the waters identified according to paragraph 1 and which contribute to pollution”.

In addition, Article 3(1) refers to ‘[w]aters affected by pollution and waters which could be affected by pollution if actions pursuant Article 5 [on the national action programmes] is not taken’. These waters are identified as such by the Member States ‘in accordance with the criteria set out in Annex I’. The most important of these criteria is, probably, that waters should be identified as (at risk of being) “polluted” in the sense of Article 3(1) when they contain more than 50 mg/l nitrates or could obtain more than 50 mg/l nitrates if action pursuant to Article 5(1) is not taken. Based on these criteria, the Netherlands have, for instance, declared their entire territory—except the overseas parts—to qualify as a vulnerable zone (Ministeries LNV & IM, 2017).

As follows from Article 4(1)(a), Member States also should come up with (a) ‘code(s) of good agricultural practices’, including provisions that farmers should adhere to if they choose to be bound

by the code(s). When establishing these codes, certain items *should* be in there (Annex II.A), such as items regarding the use of fertilizer to steeply sloping ground; while other items, however, *can* be incorporated into the codes, if the Member States wish to do so (Annex II.B), such as items on land use management.

One of the most important obligations arising from the Directive for the Member States, is the obligation in Article 5: With regard to the vulnerable zones, Member States have to set up action programmes for periods of four years that include measures as to realise the objectives in Article 1. It concerns both, the measures in Annex II on the code(s) of good agricultural practice and those detailed in Annex III to be included in action programmes, as referred to in Article 5(4)(a) (Article 5(4)) (Ministeries LNV & IM, 2017). A very important measure is that Member States should make sure the application of nitrogen by manure does not exceed 170 kg/ha (Annex III).

Articles 6 and 7 then set out how concentrations should be monitored—referring to Annex IV, mentioned above. Article 8 allows for an adaption of the Annexes to scientific and technical developments, for which the procedure as laid down in Article 9 should be followed. Article 10 obliges the Member States to create a report with respect to their four-year action programmes, which should contain the components listed in Annex V. The European Commission will then, within six months upon receiving the reports from the Member States, come up with summary reports to be communicated to the European Parliament and to the Council (of Ministers) (Article 11).

3.4 Implementation of the Directive and infringement procedures

3.4.1 Netherlands

The current Dutch policy with regard to manure focuses on controlling the manure production and reducing the loads to soils and water (Van Grinsven, Tiktak & Rougoor, 2016). Most of the regulations on manure in the Netherlands can be found in the following legislation (Ministeries LNV & IM, 2017):

- The Manure and Fertilizer Act (*Meststoffenwet*, Mw), on which are based:
- The Decree on the Implementation of the Manure and Fertilizer Act (*Uitvoeringsbesluit Meststoffenwet*, Ubm) and
- The Regulation on the Implementation of the Manure and Fertilizer Act (*Uitvoeringsregeling Meststoffenwet*, Urm);
- The Decree on the Usage of Manure and Fertilizer (*Besluit gebruik Meststoffen*, Bgm), which is based on the Soil Protection Act (*Wet bodembescherming*, Wbb);
- The Decree on Environmental Management (*Activiteitenbesluit milieubeheer*, Ab); and
- The Water Act (*Waterwet*, Ww).

The Mw is the main legal instrument in which the Directive has been implemented in the Netherlands. It contains rules that, *inter alia*, deal with norms for manure usage, accountability, and the amounts of manure animals are allowed to produce and total amounts of manure that are allowed in production (Grinsven, Tiktak and Rougoor, 2016). These rules are then elaborated upon in greater detail in the Ubm and the Urm. The instructions on the usage of manure have been laid down in the Bgm, which is a decision—as said—based on the Wbb. In the Ab one can find provisions on zones that should be free from cultivation and fertilisation, as well as rules on the storage of manure. The general prohibition on dumping, which can be found in Article 6.2 of the Ww, also plays an important role in the Dutch manure policy.

Since the promulgation of the Directive, there have been six action programmes (in compliance with Article 5 of the Directive), which applied to the whole country (for the entire country was marked a “vulnerable zone” as mentioned in Article 2(k), see above): the first related to the period 1996–1999, the second to 2000–2003, the third to 2006–2009, the fourth to 2010–2013, the fifth to 2014–2017 and the sixth (in force today) relates to 2018–2021 (Willems, Schouman & Velthof, 2013).

Of great importance in the history of the Dutch implementation of the Nitrates Directive, has been the 2nd October 2003, when the European Court of Justice ruled on the Dutch manure policy (Curia, 2003).⁵ This judgment marks the end of twelve years of struggling between the Netherlands and the European Union about its implementation in the Netherlands (Bavel, Frouws & Driessen, 2004). The Court declared the Dutch policy, incorporated in the first action programme, to be inconsistent with the obligations following from the Directive. The central instrument was MINAS (MINeral Accounting System), which involved registration of mineral inputs in fertilizers and feed, of mineral outputs in products and manure on individual farms, and definition of permitted levy-free surpluses, in dependence of farm structure (Henkens & Keulen, 2001). Since it came into effect, MINAS caused great political discussion on a national and international level, which especially had to do with the way standards were set (Bavel, Frouws & Driessen, 2004).

Consequently, towards the end of 1999, the European Commission started an infringement procedure against the Netherlands before the Court (even though they had offered to sharpen the standards in the Mw), for its implementation of the Directive did not comply with how it should have been. The infringement was constituted by the following violations, in the eyes of the Commission (Henkes & Keulen, 2001):

- Some legal measures for manure storage were announced, yet they were still not effective and the Commission found this to have taken too long;
- The amount of manure allowed in the Netherlands was higher than allowed by the Directive, and the Commission deemed the (aforementioned) changes in the Mw standards to be insufficient;
- The additional policy on dry sand grounds was seen as too late and, hence, insufficient;
- The mineral charges were not prohibitive: one could pay as to ‘compensate’ for exceeding the standards;
- The limitations of the usage of fertilizer paid too little attention to the balance between the expected need for nitrogen of the soil on the one side and the supply of that nitrogen through the soil and the fertilizer on the other side.

The Court of Justice ruled that the Netherlands did not comply with the obligations following from the Nitrates Directive and, hence, that MINAS (at the very basis of the Dutch implementing legislation) contradicts the Directive. More specifically, according to the Court, the Netherlands did not comply with the Directive (Bavel, Frouws & Driessen 2004) in the following ways:

⁵ European Court of Justice, Judgment of 2 October 2003, Commission / Netherlands (C-322/00, ECR 2003 p. I-11267) ECLI:EU:C:2003:532.

1. By not giving rules on the minimum of fertilizer to be stored on company level;
2. By not including rules in the action programme that are based on a balance between the expected need for nitrates of the soil on the one side and the supply of those nitrates through the soil and the fertilizer on the other side;
3. By not including standards of use in the action programme as to reduce the amounts of nitrates brought on or in the soil to the amounts specified in Annex III of the Nitrates Directive (170 kg/ha, except for derogations);
4. By not coming up with provisions for the use of fertilizer, the application of manure near watercourses and the assignment of steep slopes, as to keep the drainage of nutrients into the water on an acceptable level; and
5. By not including in the action programme additional or sharpened rules concerning dry sand ground.

Due to this judgment, the Netherlands found itself with a policy inconsistent with the Nitrates Directive, the implementation of the latter thus had to be adapted by amending the relevant legislation. The MINAS was abandoned and crop- and soil-specific fertilisation standards introduced. With its third action programme (2006-2009), the Dutch government reached an agreement with the European Commission regarding the national implementation of the Directive (OECD, 2007).

3.4.2 Germany

Also, the German standards of implementation were apparently not according to expectations. In 2016, the European Commission referred Germany to the Court of Justice of the European Union (CJEU) for failing to take stronger measures to combat water pollution caused by nitrates. Despite the figures that showed worsening nitrate pollution on groundwater and surface waters, German authorities have not shown sufficient additional measures to address this issue (EC, 2016).

That was the case until 2017 when the revision of the Fertilizers Ordinance (*Düngeverordnung*) was introduced. This is the main piece of legislation that implements the Directive. According to Article 1 of the Ordinance, it is supposed to regulate good agricultural practice for the fertilization of farmland and to aim at reducing material risk associated with the application of fertilizer. Overall, this piece of legislation limits the quantity of applied nutrients and detailed technical or management specifications. More specifically, it includes application ceilings, balance requirements, limitations on balance excesses, permitted application periods and prohibitions and minimum distances to be maintained from bodies of surface water (Umweltamtrat, 2015). Similar to the Netherlands, the whole country was marked as a 'vulnerable zone' and action programmes were introduced, with introducing the Fertilizer Ordinance as a central instrument (Taube et.al., 2013). Moreover, the legislation specifies sanctions for violations of law. Most of them are punished by cutting the direct payments ensured by the Common Agricultural Policy. Nevertheless, some violations qualify as administrative offences under national law and are punished by monetary fines under chapter 14 of the Ordinance.

Other documents implementing the Directive are the Ordinance on Fertilizer Quality (*Düngemittelverordnung*) and the Ordinance on Marketing and Transport of Manure (*Verbringungsverordnung*). Nevertheless, those are much more specific and play a supportive role to the Fertilizers Ordinance.

The main flaw of the Fertilizers Ordinance was that fertilizer planning was unspecified and not binding before, in the 2007 version, but that a revision remedied this by making it more clearly defined and compulsory (Kuhn, 2018). Despite the changes, the CJEU ruled in 2018 that it is not enough to ensure sufficient protection and Germany violated EU law by not keeping up with the standards set out by the Directive. Moreover, in case there is no improvement in the future Germany would have to pay fines (Curia, 2018).⁶

4. Environmental Problems due to Agricultural Practices in the Border Region; Implementation Problems?

As described above, the main aim of the Nitrates Directive was and is to reduce the soil and water pollution caused by manure usage. This section will be concerned with the analysis of these goals and will evaluate the environmental impact of the Nitrates Directive in the Netherlands and Germany. To analyse the environmental impact in greater detail, the section is split into two subsections. The first is concerned with soil pollution caused by manure usage, while the second will cover water pollution. A final conclusion will then merge the two analyses together.

4.1 The Impact on Soil in Agricultural Areas

Analysing soil pollution has turned out to be the most difficult part of this analysis. Although multiple explanations on how soil gets polluted by extensive manure usage could be found – some of which are highly visually aesthetic (Figure 4.1 below) – no raw data, nor any pre-processed and analysed data could be obtained. The Dutch impact report (RIVM, 2017) as well as the German national report (BMU, 2017) and some local impact reports (Kreis Viersen, 2018) all seem to mainly focus on the water pollution. Although water pollution is an equally important factor to consider, soil pollution should not be neglected.

Due to the lack of data, it has not been possible to produce any quantifiable findings about soil pollution. Indirect inferences can, however, be made by using water pollution data. This follows from the fact that nitrates first have to be absorbed by soil to finally reach groundwater. Thus, we suspect that an increase in the nitrates in groundwater would also imply an increase in nitrates in the soil above the groundwater. Therefore, the analysis in the following section also gives hints for the soil conditions.

⁶ European Court of Justice, Judgment of 21 June 2018, Commission / Germany (C-543/16) ECLI:EU:C:2018:481.

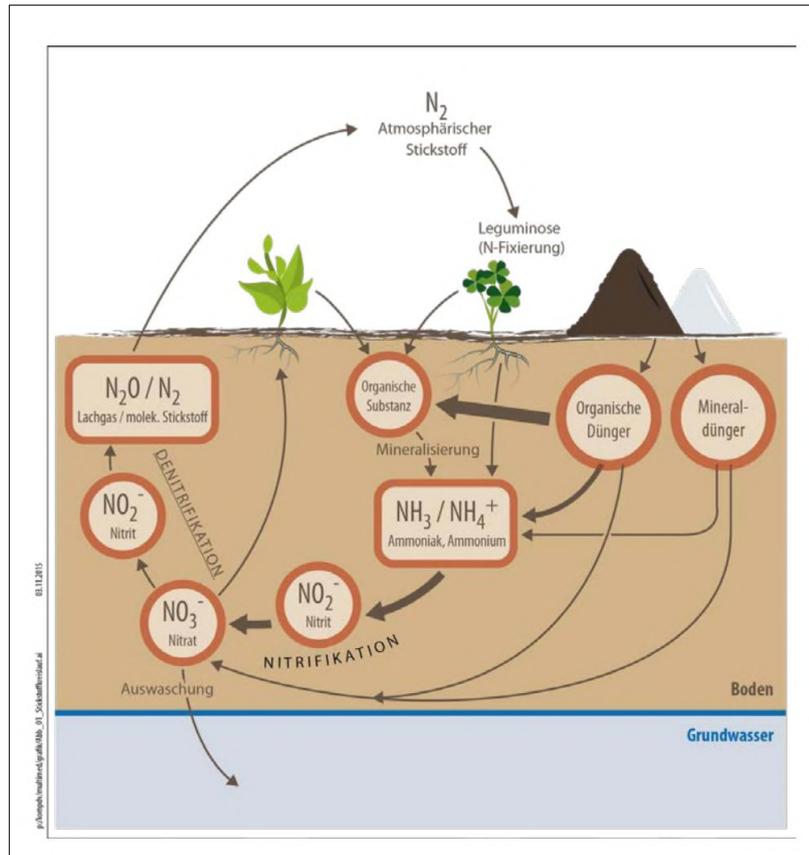


Figure 4.1: Nitrates Cycle. Source: Kreis Viersen 2018, Abbildung 2 p.8.

4.2 The Impact on Groundwater in Agricultural Areas

Similar to the soil pollution case, it has also not been possible to obtain any raw data about water pollution. In contrary to soil pollution, however, both governments publish regular reports about water pollution. In this section, we will analyse these reports and compare them to each other to obtain insights into the environmental impact of the Nitrates Directive. Since this report mainly focuses on pollution caused by manure usage, we will look into groundwater in agricultural areas.

Although we will mainly work with national reports, insights into the border regions can be obtained to some extent. It has to be remarked that it was possible to find water-impact reports for German border regions, while no such reports have been found for Dutch border regions. Therefore, the team decided to only focus on the national reports. It further has to be noted that Germany has recently changed the measurement locations. Although this allows a better analysis of Germany's water pollution, it makes comparisons with previous time-intervals, and with the Netherlands difficult. For this reason, one must be cautious not to draw conclusions too fast.

The Nitrates Report (BMU, 2017) of the German government states that there have been no significant changes between the period 2008-2011 and the period 2012-2014. That this is a rather concerning situation, as can be seen from Figure 4.2 (and following below) in which it becomes clear that the majority of all measurement locations have either a very low, or a very high nitrates concentration.

Here, very high means that the measurement was higher than 50 mg/l and thus violates the EU regulations. In fact, 28% of all locations within Germany still violate the Nitrates Directive and there does not seem to be any improvement since 2008 (Figure 4.3). Further, 16% of all locations have shown a high increase in groundwater pollution (Figure 4.4). Although one has to remark that overall the number of locations where the measured nitrate concentration decreased over the last two periods is higher than the number of locations where the concentration has been increasing, these 16% are still rather alarming. This is due to the fact that these 16% also include locations that had already measurements of more than 50 mg/l. This, and the fact that a sizeable amount of measurement locations close to the Western border are such high-measurement locations can be seen in Figure 4.5 (below).

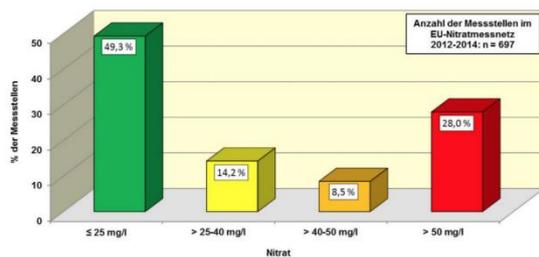


Figure 4.2: Frequency Distribution of Nitrates Concentration in Groundwater in Germany (2012-2014). Source: BMU 2017, Abbildung 20 p.40.

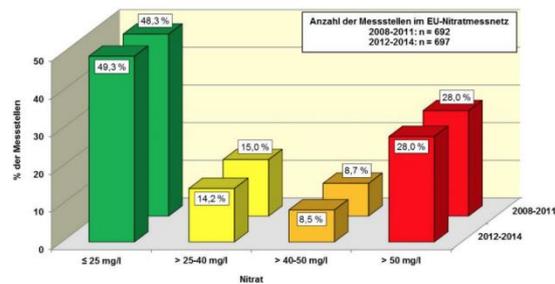


Figure 4.3: Frequency Distribution of Nitrates Concentration in Groundwater in Germany; Comparing 2008-2011 to 2012-2014. Source: BMU 2017, Abbildung 21 p.41.

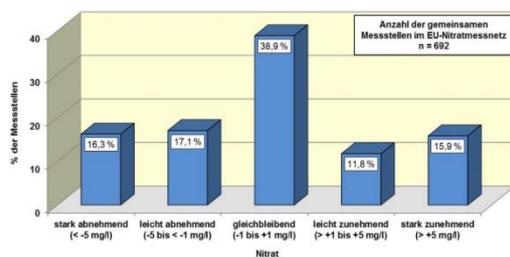


Figure 4.4: Frequency Distribution of the trend in the Nitrates Concentration in Groundwater in Germany. Source: BMU 2017, Abbildung 22 p.42.

The latter fact might be explained by manure trade between Dutch and German farmers. This factor will be discussed in the section about exports and imports. The former fact, however, cannot be completely explained by trade. Despite the trade between Dutch and German farmers, the Nitrates Directive should be implemented in a way that protects problem zones from becoming even worse. Thus, the **high increase in groundwater pollution in areas which have already been classified as**

problem zones might indicate that the current implementation of the Nitrates Directive into German laws is not ideal.

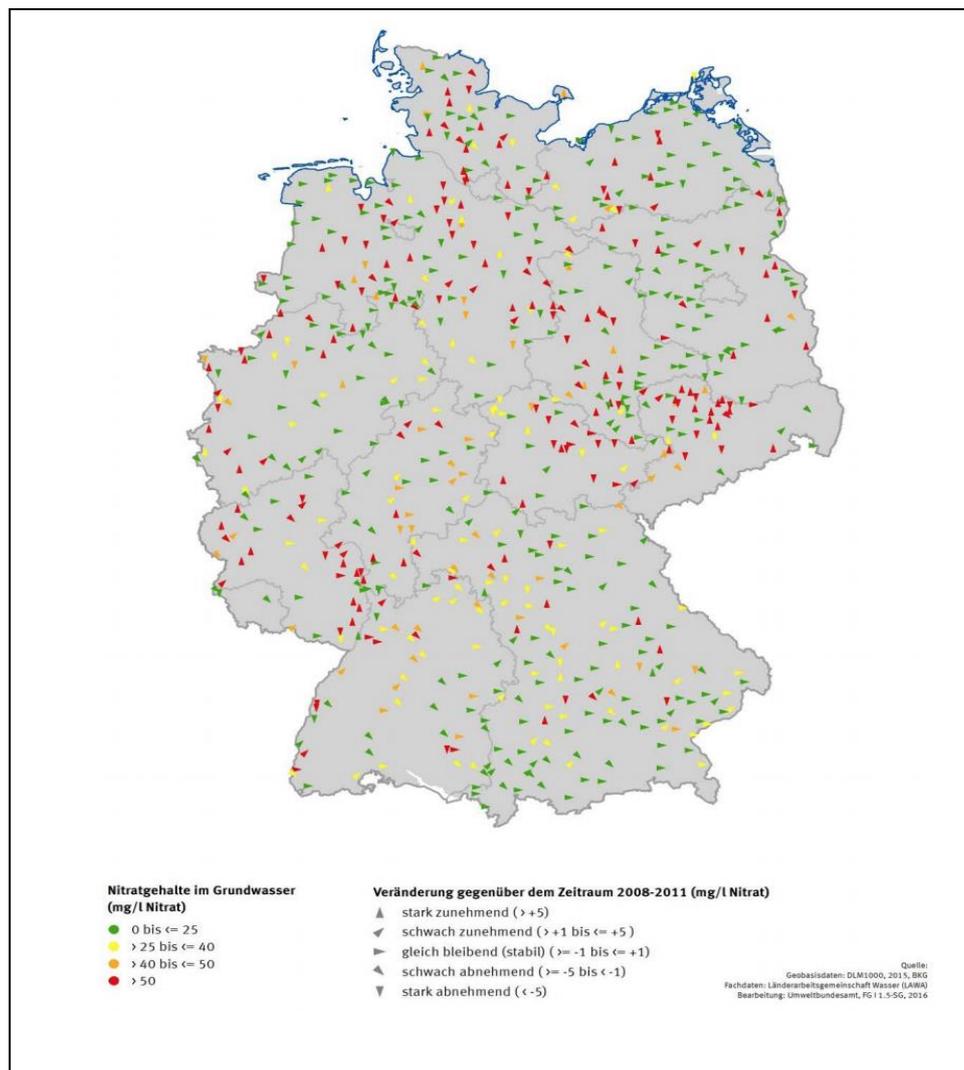


Figure 4.5: Change in the Mean Nitrate Concentration in Groundwater at various Measurement Locations. Source: BMU 2017, Abbildung 23 p.43.

Similar to the German report, the Dutch report shows no significant changes between the period 2008-2011 and the period 2012-2015 (RIVM, 2017). The Dutch report does, however, show a decrease of the average nitrate concentration in groundwater over the time period from 1984 to 2015. Thus, the average water pollution under agricultural land has decreased since the implementation of the Nitrates Directive. This decrease totals to an amount of 5mg/l. It can, however, be seen from Figure 4.6 below that regarding the average water pollution there has never been a problem. The average nitrate concentration was around 24 mg/l in 1984 and thus well below the European threshold. It therefore requires a more in-depth analysis to determine the effectiveness of Nitrates Directive in the Netherlands.

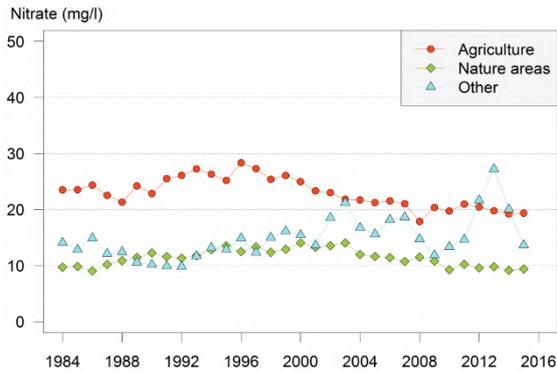


Figure 4.6: Average annual nitrate concentration (mg/l) in groundwater in the Netherlands at a depth of 5-15 m below ground level per type of land use. Source: RIVM 2017, Figure 2.1 p.20.

Nitrate class (NO ₃ mg/l)	All monitoring sites			Monitoring sites in agricultural areas		
	'92-'95	'08-'11	'12-'15	'92-'95	'08-'11	'12-'15
0-15 mg/l	79	82	82	80	82	84
15-25 mg/l	4	3	3	2	3	0
25-40 mg/l	2	4	3	0	2	2
40-50 mg/l	3	0	2	2	0	1
> 50 mg/l	13	11	11	16	12	13
Number of monitoring sites	347	347	347	219	219	219

¹ The total percentage may be higher or lower than 100 due to rounding off.

Figure 4.7: Percentage of monitoring sites in groundwater at a depth of 5-15 m per nitrate concentration class in the various reporting periods. Source: RIVM 2017, Table 2.1 p.21.

In the period between 1992 and 1996, thus the first implementation period of the directive, 13% of all measurement locations had been violating the 50 mg/l threshold. In the most recent period from 2012 to 2015, this has not changed significantly. Although the percentage did drop to 11% between these two periods, a long-term change did not seem to have happened (Figure 4.7 above). Thus, also for the Netherlands, it is questionable whether the current implementation of the Nitrates Directive is as effective as it should be, a situation similar to the German one. A further similarity follows from the percentage of locations that show a large increase in the nitrate's concentration in groundwater. This lies around 9% in the case of the Netherlands. Although this is much smaller than in the case of Germany (16%), it might still be an alarming signal if a significant amount of these locations were already problem zones. Whether this is the case cannot clearly be derived from the report. All that can be derived is that a large amount of these are border regions (Figure 4.8 and following below). It has to be noted again, that the total amount of decreasing locations is larger than that of increasing locations. Thus, a small improvement can be observed after all.

Lastly, the Dutch report, similar to the German report, shows a significant amount of problem zones in the regions of Limburg and Noord Brabant (Figure 4.7). Both lie close to the border and in the Euregion and might thus be affected by manure trade.

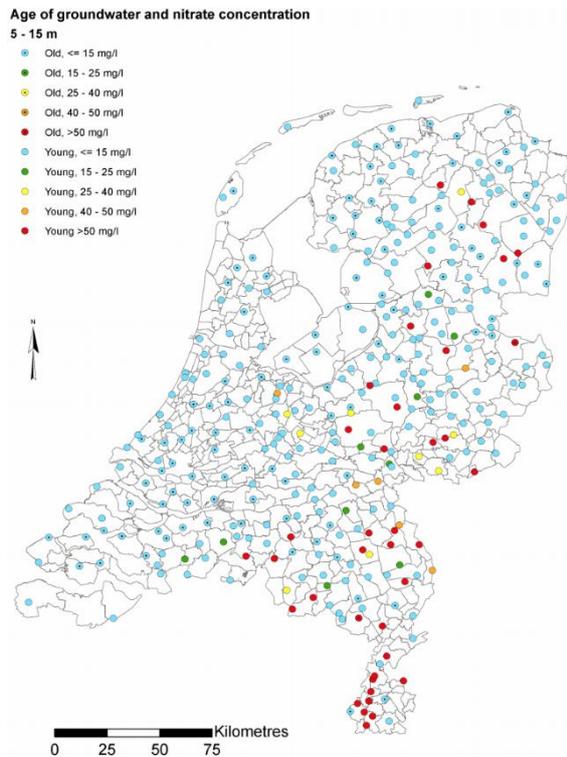


Figure 4.8: Average nitrate concentration in groundwater at a depth of 5-15 m for the period 2012-2015. Source: RIVM 2017, Map 2.1 p.25

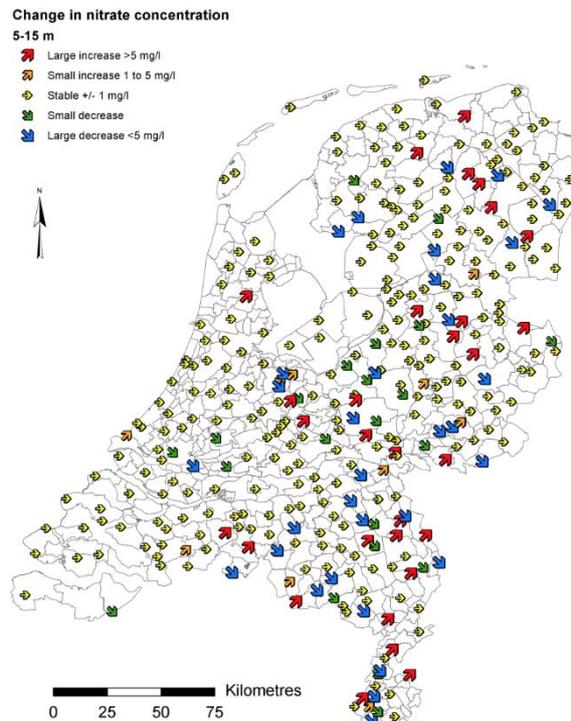


Figure 4.9: Change in the average nitrate concentration in groundwater at a depth of 5-15 m for the period 2008-2015. Source: RIVM 2017, Map 2.2 p.26

Concluding the above analysis, both, the Netherlands and Germany, do not show any significant changes between the last two implementation periods. Although a positive change is indirectly implied by the fact that more locations show signs of decreasing water pollution than increasing water pollution, a direct effect is not observable. Further, the effectiveness of the Nitrates Directive on water pollution is questionable at least in the German case, since a significant number of zones already classified as problem zones, still show signs of high increases in nitrates pollution. Thus, while some areas seem to become better, others seem to violate the EU threshold by higher and higher amounts. Lastly, both countries show a significant amount of problem zones close to the border. The team suspects that this might partially be caused by manure trade, in case of Germany, and the high life stock population in case of the Netherlands. This will further be analysed in the following section.

Although these findings above reflect more the general situation in the two countries, the fact that a lot of problem zones are located in the Euregion Rhine-Maas North shows that the above is even more applicable to this Euregion. It is expected that in this region, especially, the manure trade and weak enforcement cause the stagnating situation. The former will be further discussed in the next section. How well the enforcement works could unfortunately not be analysed since no data was available.

5. Economic Impact of the Nitrates Directive

5.1 Manure Disposers

To gain a better insight into the causes of the fraud, it is important to have a clear image of the market for manure trade in the Netherlands. A simplified model of the market, such as the one in Figure 5.1 below, would show three main actors in the transactions (Ministerie LNV, 2018).

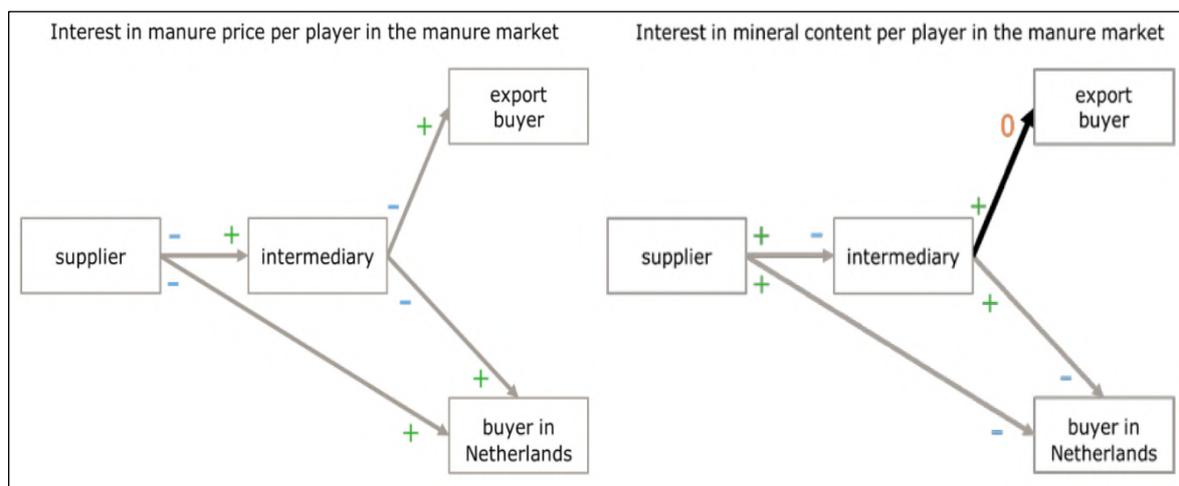
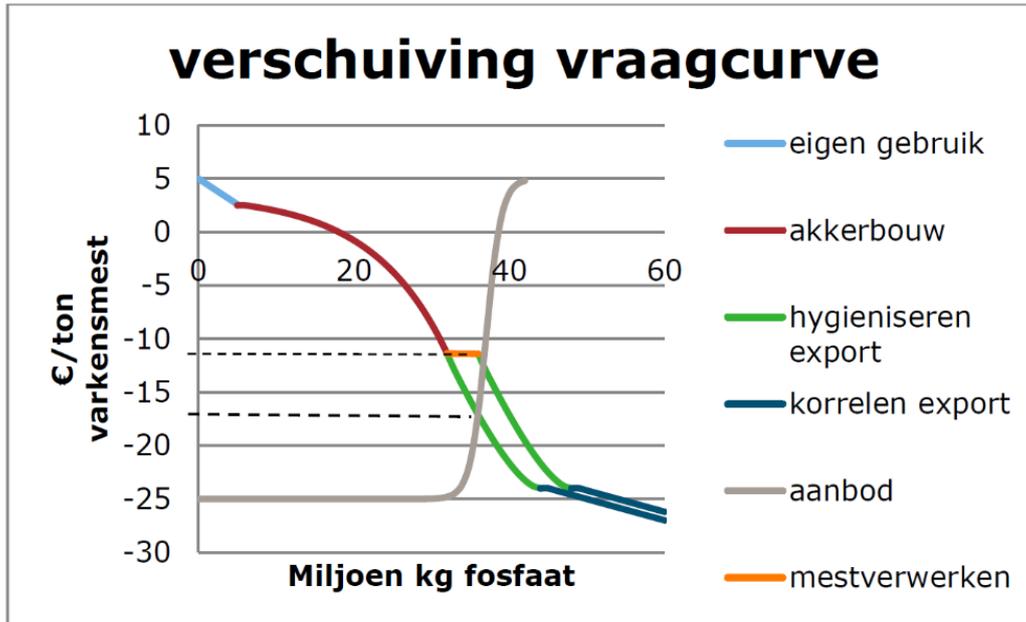


Figure 5.1: Manure Market Model. Source: Keijer 2018, Figuur 3.1 p.25.

Firstly, there is the supplier of the manure. This company holds some type of livestock that produces manure. Farmers are allowed to use this manure on their own land, provided that they stay within the EU standard of 170 kg of Nitrate per hectare (RVO, 2019a). If they produce more manure than is allowed for their area, they have to sell it. Secondly, the market also consists of a demand side. Buyers are usually also farmers, but they operate mostly with agriculture, fruit, vegetables, or pastures. Since they do not have manure of their own, they buy it from cattle farmers with a surplus (Koeijer, 2018). Finally, the most important players in this market are the intermediaries. As official traders, they must be registered with the Netherlands Office for Entrepreneurship (RVO), since they fulfil different roles in the chain of manure. Intermediaries make sure demand meets supply by arranging transport. Additionally, they might execute the processing of manure to suitable products (Neve et al., 2016). In the beginning of 2019, 1125 companies were officially registered with the RVO (RVO, 2019c). Figure 5.2 below shows a model of the current equilibrium situation in the manure market, where supply meets demand at a negative price of around €15, indicating that farmers have to pay to dispose of manure (Koeijer, 2018).

The market's unit of interest is not the amount of manure, but rather the area of agricultural land, since the amount of manure is bound to the European directives (Ministerie LNV, 2018). Around fifty percent of the manure can be used on the producer's own land. Compared to the total amount of available disposition area within the standards of the EU directive, around thirty percent is shipped directly to other farmers or private individuals, leaving about fifteen percent to be either exported or processed (Koeijer, 2018).

Figure 5.2: Supply and demand in the market for manure. Source: Koeijer 2018, figure S.1 p. 8



5.2 Exports/Imports

This section will focus on manure exports and imports and will try to analyse in how far these processes impact the environment. Since no data was available for the Euregion specifically, country data will be used under the hope that some general conclusions also apply to the Euregion.

Germany is the biggest receiver of Dutch exports of manure and has been so for years (RVO, 2019b). Germany accounts for about 50% of the manure exported from the Netherlands, followed by Belgium and France. In 2018, this amount was approximately 3 million tons of manure, a level comparable to 2015. The data in Appendix C show that the export to Germany follows a trend that lies close to the trend of the overall export. This is a trend of slow decline since 2016. Additionally, the data shows that the amount of nitrate exported shows a development that lies very close to the amount of manure. In 2018, Germany imported 17 million kg of nitrate.

Further data show that in terms of volume, manure of pig origins (~25%) and mixed/other manure (~45%) are the biggest subcategories of the manure being exported to Germany. However, when looking at the amount of nitrate divided into these subcategories, another picture arises. In terms of Nitrate, manure of poultry (~35%) and pig origins (~40%) are the most important types of manure exported to Germany.

The reason for Germany being the major manure trading partner can have multiple origins. One of these reasons can be seen in Figure 5.3 below, which shows manure production over land area in the border regions defined in section one. As can be seen, Limburg and Brabant produce significantly more manure per square kilometre of land than do Lower Saxony and Saxony-Anhalt. Thus, Germany has

relatively more room for manure than does the Netherlands, which might explain the high trade between the states. Further reasons include the close proximity, and ease of trade.

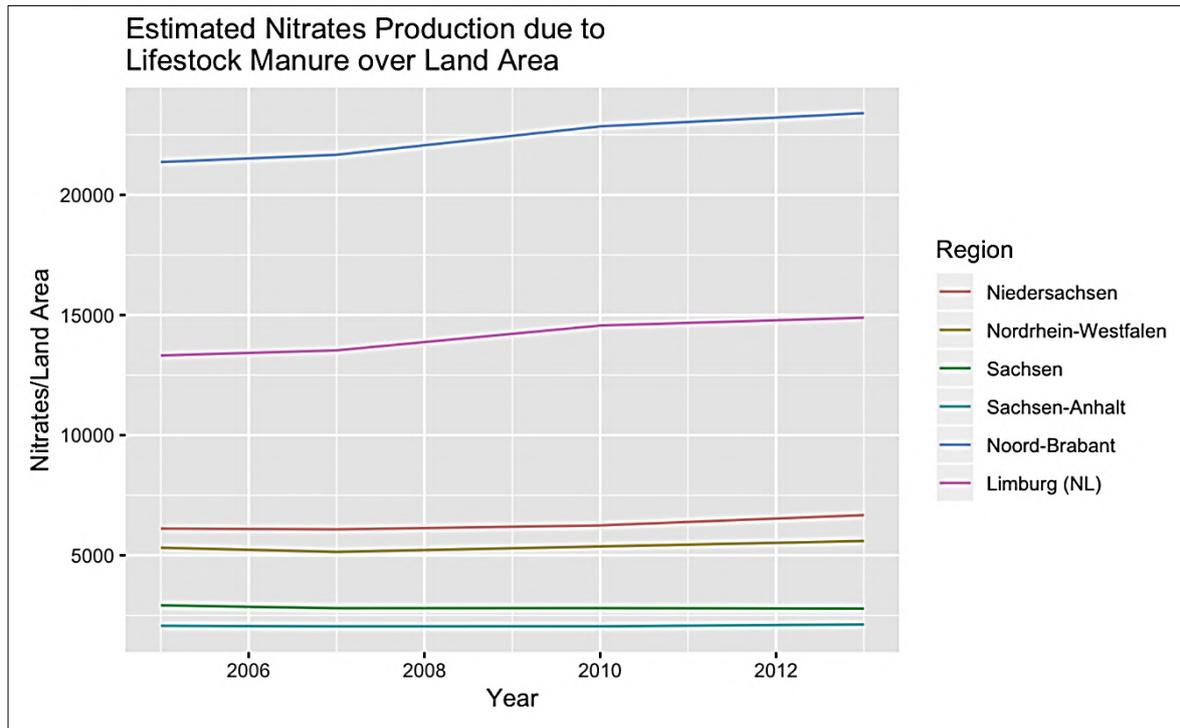


Figure 5.3: Manure Production over Land Area (km²). Source: Data from EUROSTAT 2017, Livestock: number of farms and heads of animals of different types by agricultural size of farm (UAA) and NUTS 2 regions [ef_olsaareg]

Interestingly, the importance of manure of bovine origins is extremely low, both in terms of volume (manure in tons), as well as the amount of nitrate (in kg). Manure of bovine origin accounts for 1% of the total volume in both categories. This would contradict the image painted by Neve (2016), which suggests that the abolishment of the milk quota in the Netherlands has led to an increase in production of bovine manure, contributing to the manure problem in the Netherlands (Tuenter, 2016). The underlying assumption implies that an increase in bovine manure should have led to more exports (amongst others to Germany). However, two important points should be made here. Firstly, the increase of the amount of manure of bovine origin does not necessarily lead to an increase of the official (legal) export to Germany. As will be addressed in the following section on fraud, intermediary firms play an important role in the illegal disposal of manure (Koeijer, 2018). Secondly, of the many forms of fraud addressed by Neve (2016), most of them take place in internal processes, such as mixture with other garbage or simply incorrectly reporting the number of animals at the farm. The next section will thus focus on the fraud with exports (to Germany), while also considering the above-mentioned other types of manure fraud.

5.3 Fraud

Livestock farming is often concentrated in certain areas, as in our study in the Dutch region of Brabant and Limburg, leading to manure surpluses in some, and shortages in other regions. A way to tackle the problem of these imbalances, is, the export (and import) of manure. While we already showed that

the border regions of Germany, which have relatively little livestock, officially import large amounts of excess manure from the Netherlands, the de-facto amount of manure imported from the Netherlands might be way higher (Leenstra et al., 2014).

Recent statements by regional German governments and newspaper articles, point out the potentially large amount of illegal imports of manure and, hence, manure fraud. However, illegal exports are not the only aspect of manure fraud that has to be considered. Another way for farmers to deal with excess supply and to evade the costs of disposing the manure, is to over-fertilize their fields beyond the legally allowed amount. A report by the Dutch government estimates the actual nitrate concentration to exceed the allowed concentration by 4% to 28% in 2014, which can result in additional nitrate pollution of 5 to 30 mg per liter. A compliance monitoring of Dutch farms by the Netherlands Food and Consumer Product Safety Authority in 2014, showed that around 10% of Dutch farms fertilize their fields beyond the legally allowed maximum (Grinsven & Bleeker, 2017).

The costs of manure transportation within the Netherlands can be between 5€ and 20€ per tonne due to the high share of water in the manure. Nonetheless, the export of manure is still estimated to be profitable within a region of 150 kilometers (Leenstra et al., 2014). Hence, especially German governments of border regions in North-Rhine Westphalia (NRW) and Lower-Saxony have increasingly been criticising and trying to detect illegal imports. In September 2018, the NRW Minister for Environment, Agriculture, Nature and Consumer Protection Ursula Heinen-Esser reported in front of the regional state parliament about the illegal imports from the Netherlands. According to Dutch law, every manure export has to be registered in the so-called Digital Dossier, the consistency of the manure has to be measured and the trucks delivering the manure have to be trackable via GPS. In the past, a major problem has been that the exporters are allowed to deactivate their GPS as soon as they cross the German border, and that German authorities did not have access to the data stored in the Digital Dossier. The latter problem has been solved since 2015, when an agreement was concluded with the Netherlands that allows North-Rhine Westphalia, Lower-Saxony and Saxony-Anhalt to access the data (Landtag Nordrhein-Westfalen, 2018).

Heinen-Esser now reported on an investigation concerning the exports to North-Rhine Westphalia that are registered in the Digital Dossier. Specifically, the addresses of the 1,385 German manure recipients registered in the Digital Dossier were reviewed. The examination showed that the addresses of around 500 of the alleged recipients were wrong and, hence, the exported manure not traceable. The majority, 341, of these 500 cases was due to not existing or wrong addresses, followed by 48 cases in which no address was provided in the Digital Dossier and in 34 cases the contacted recipients reported irregularities in the provided data. Some firms denied receiving any manure at all. The large inconsistency in the data raises three major questions according to Heinen-Esser: First, if the manure actually leaves the Netherlands or if it is illegal dumped on Dutch fields; second, if the manure was imported to North-Rhine Westphalia but delivered to unknown parties; or third, if the manure was exported to a completely different region, such as Belgium. Moreover, if GPS data on unloading points are available, these are often not accurate, difficult to obtain them from a legal viewpoint and vulnerable to manipulation by exporters (Landtag Nordrhein-Westfalen, 2018).

According to the local German newspaper Rheinische Post, a razzia in the Dutch province of southern Limburg took place in November 2018. Notably, the police investigated against a consultancy firm for farmers that allegedly helped and advised Dutch farmers on how to report wrong data and commit manure fraud (Ronge, 2018).

6. Policy Recommendations

As the awareness of excess nitrate concentrations in the groundwater and soil and their possible effects, such as increasing costs of (public) water purification, rose, several governments published plans and policy recommendations on how to reduce the nitrate concentration. One example is the German district Viersen that is located close to the Dutch border and faces the problem of a too high nitrate pollution. A recent study conducted by the district Viersen, concludes that the main reason for the high nitrate concentration is the agricultural sector, and as part of that the legal and illegal imports from the Netherlands (Müller et al., 2018).

Especially with respect to such imports, the measures and policies are limited that can be implemented on a regional level. The district demands a reduction of such imports to a level that is in line with the actual regional demand. Furthermore, imports have to be more transparent, and fraud has to be clearly fined. Therefore, a tight cooperation between different authorities, increased control of manure imports is demanded and strict provisions regarding fines have to be established. Meanwhile it is recognised that tighter limits on manure disposal could potentially also require a financial compensation for farmers (Müller et al., 2018).

Another aspect of great importance is the making available of more comparable data regarding for example soil and water quality, imports and exports of manure, or the cost of legally disposing manure. The research for this dossier has in fact been restrained to certain extent because data were either not being collected or not available due to privacy regulations. Here, the provision of statistics that are comparable between Germany and the Netherlands, including at regional level, could massively help to tackle such a problem like illegal imports (Müller et al., 2018).

Moreover, as our study has outlined how very important cooperation and the sharing of data between Dutch and German border regions is. This has been underlined by the investigation of the NRW agricultural ministry that analysed data from the Dutch Digital Dossier and showed potential illegal imports. Consequently, the Environment Minister Heinen-Esser has established a task force between Lower Saxony, North-Rhine Westphalia and the Netherlands, to collectively tackle the problem of illegal imports. Furthermore, she has suggested that exports coming from the Netherlands should only officially be registered as such once the recipient has confirmed receiving the manure (Landtag Nordrhein-Westfalen, 2018).

In addition, to reduce the amount of manure production generally and, thus, to tackle the source of long-run nitrate pollution, a change in agricultural practices towards a more sustainable approach has to be made, which is also supported by the common European agricultural policy.

While policy makers acknowledge the importance of the agricultural sector for society, agriculture and especially livestock farming should be compatible with protecting the environment and scarce resources. Therefore, innovative solutions have to be found, including for instance new technologies for fertilizing (Müller et al., 2018).

7. Conclusion

This dossier has aimed to analyse ex-post the impact of the EU nitrates directive, especially focusing on the effects on the border region Euregio Rhine-Meuse-North and on the potential practice of

manure fraud. Since a lot of data was not available for the Euregion specifically, the team had to use country data instead. While this weakens the conclusions about the Euregion, it was however the best possible option at this point. We would suggest making more detailed data available, so that future research can look into regional effects more precisely. This would allow to target different regions with different policy programs as a basis for making the enforcement of the Nitrates Directive more effective.

The most important aspect of the Nitrates Directive within EU law, is that it is part of a much bigger framework that strives for protecting the environment, while at the same time it aims not to harm the agricultural sector. When analysing the aspect of European integration with respect to Article 191 of the TFEU and the extent of legal harmonisation between the Netherlands and Germany regarding levels of nitrates in water and soil, we found differences in the level of implementation between the two bordering countries.

The Netherlands has implemented the Nitrates Directive and spread the implementing provisions over several legal instruments. The CJEU ruled in 2003 that there were many flaws in the Dutch implementation as set out in the first action programme (in which the MINAS registration system played a fundamental role) and that the Netherlands did not comply with its obligations following from the Directive. The main problem with the implementation concerned the standards for the storage etc. of manure and fertilizer. Initially, for example, Dutch law included neither provisions on the minimum amount of manure and fertilizer to be stored in companies, nor did it set standards on how to deal with the manure and fertilizer (standards of use). With regard to the subsequent action programme, the Dutch government reached an agreement with the European Commission regarding the national implementation of the Directive.

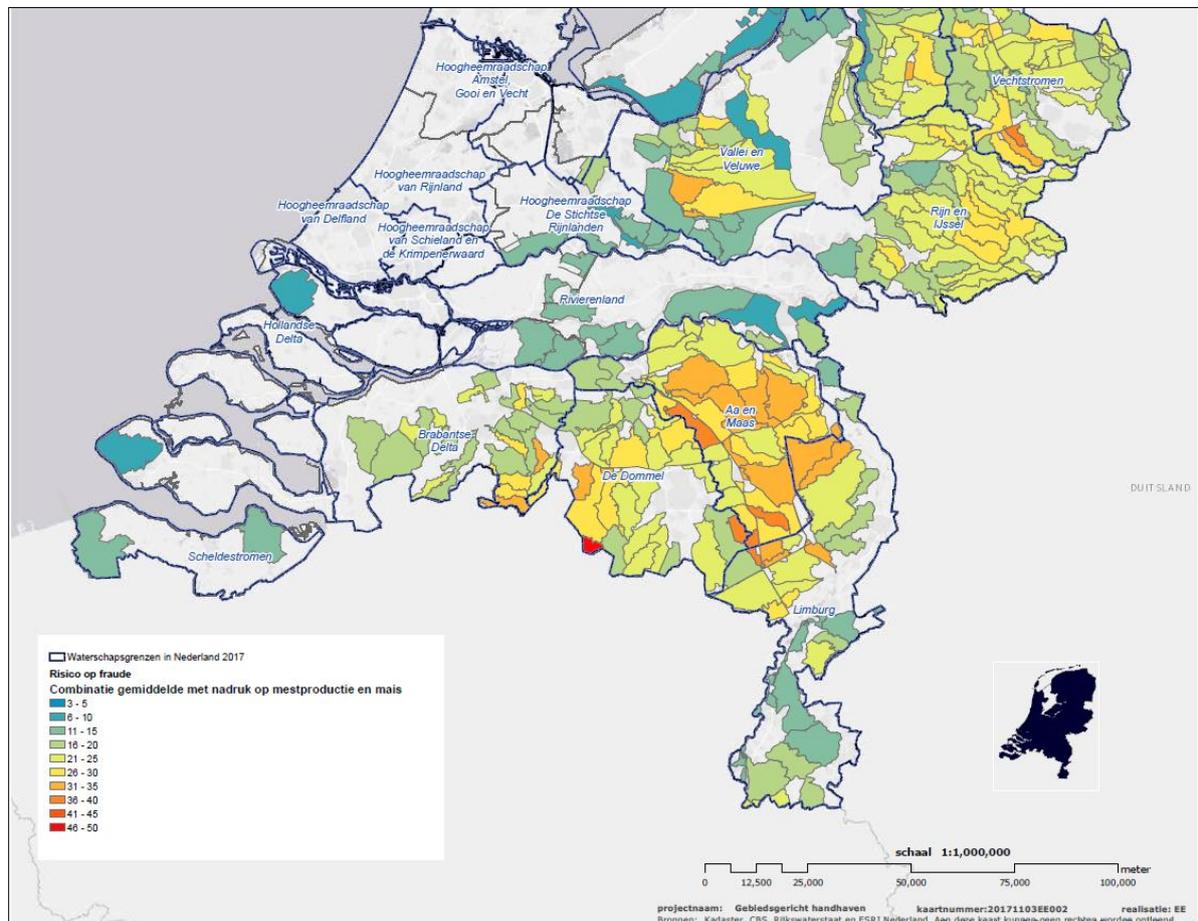
In Germany, too, the Directive's implementation had many flaws, it was especially considered too imprecise. The main flaw of the German Fertilizers Ordinance has been that fertilizer planning was unspecified and not binding before, while a legislative revision sought to remedy this by making it more clearly defined and compulsory. Despite the changes, the CJEU ruled in 2018 that German law was still not fit to ensure sufficient protection and that Germany violated EU law by not keeping up with the standards set out by the Nitrates Directive. Moreover, in case there will be no improvement in the future, Germany would have to face monetary fines.

In terms of sustainable socio-economic development, no clear effect of the implementation of the Nitrates Directive could be observed. The available data does not show any significant, only small and regionally concentrated, improvements in soil or water quality over time. Contradictory to the aim of the directive, we found an increase in the nitrate concentration, to levels above the allowed EU norm, in the so called 'problem zones' in Germany, especially in regions close to the Dutch border. Furthermore, our analysis highlighted the manure surpluses in Dutch, and deficiencies in German regions, due to differences in the intensity of livestock farming in those regions.

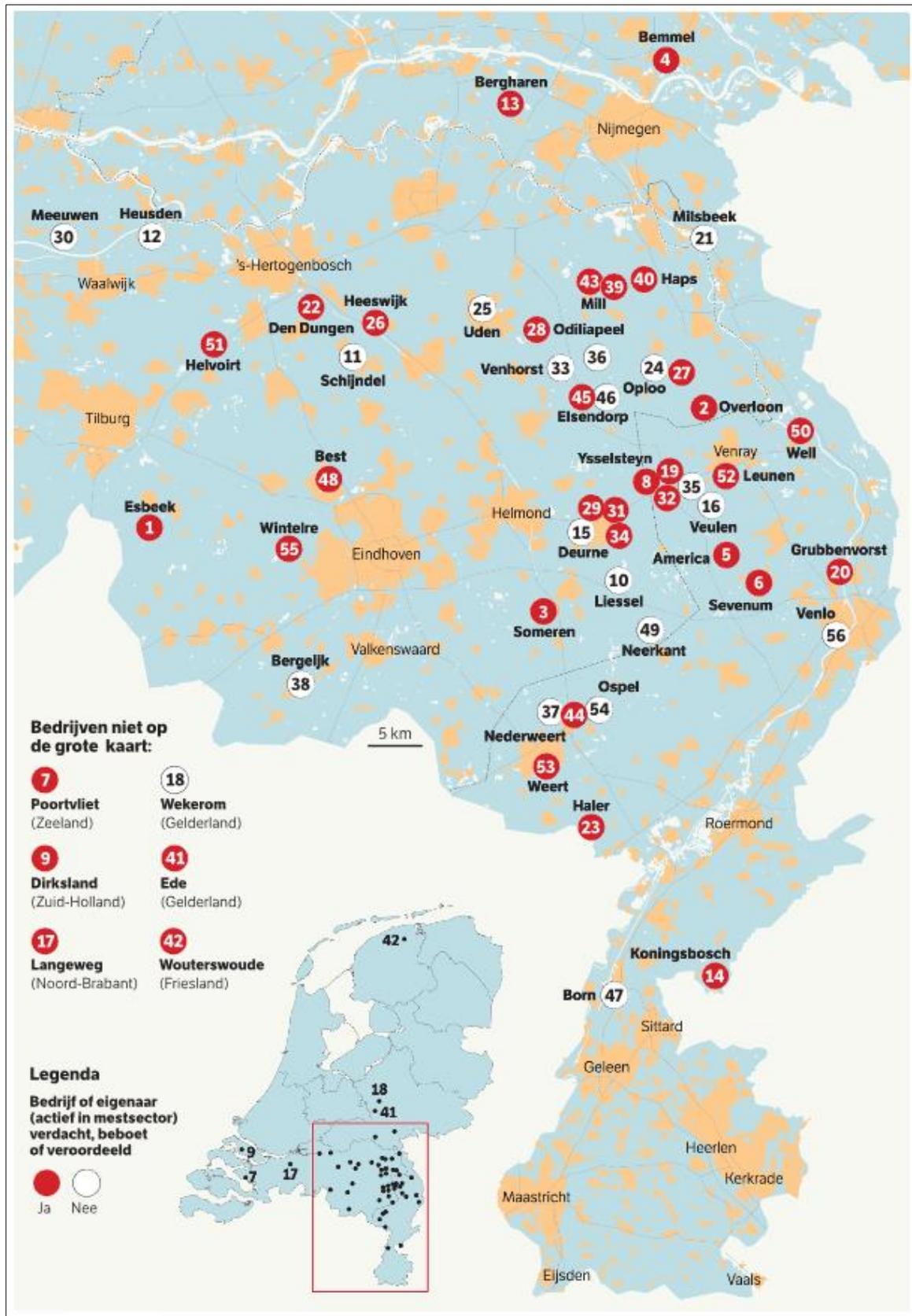
These findings explain the severe cross-border trade of manure, especially the export of Dutch manure to German border regions. However, the legal disposal or export of manure can be costly, which led to increasing manure fraud. Such practices are encouraged by different levels of surveillance, e.g. different regulations regarding the tracking of trucks, in the two countries and put additional pressure on German border regions, already suffering under nitrate pollution.

8. Appendices

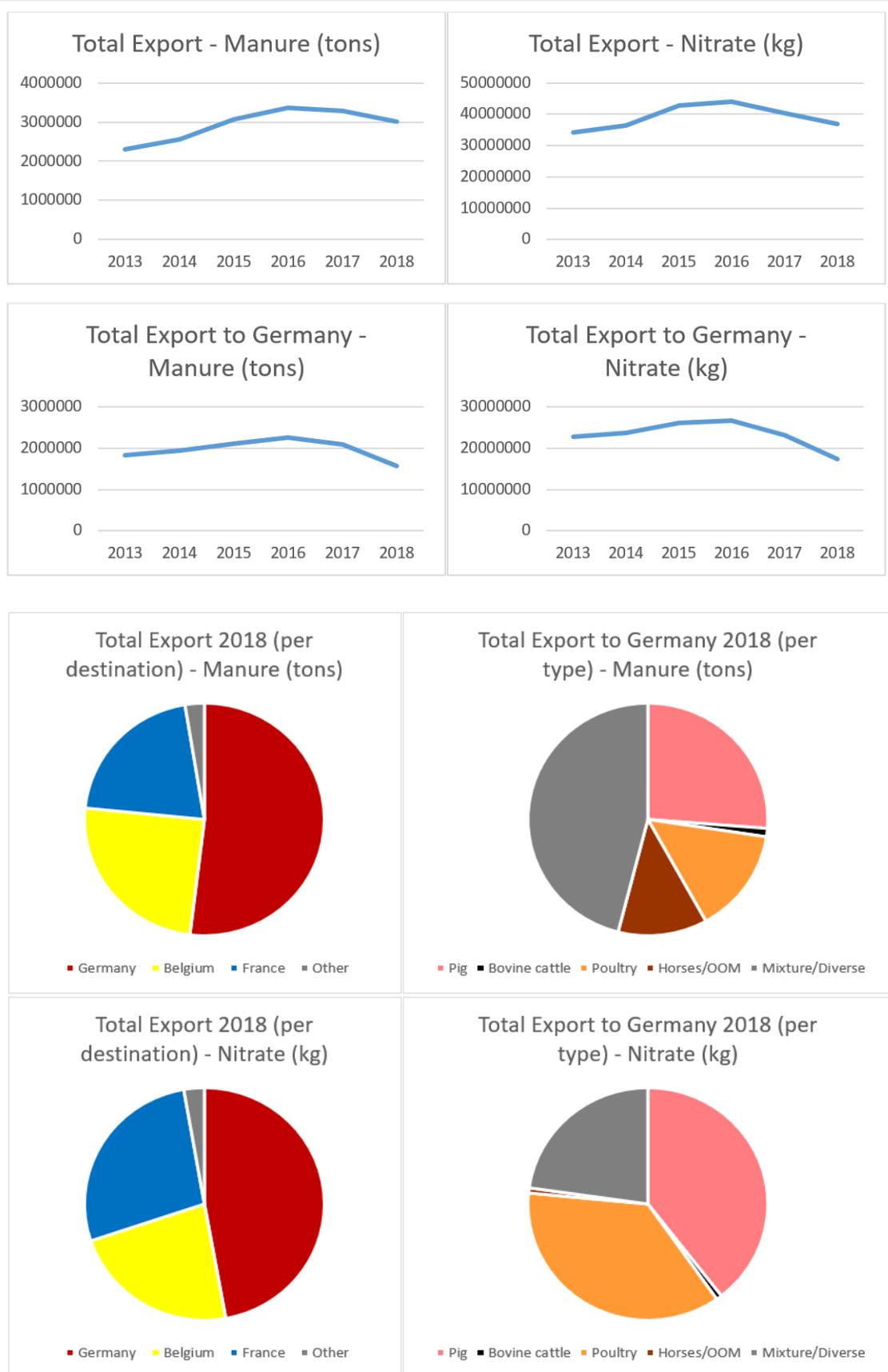
Appendix A - Excerpt of a map showing areas in the Netherlands and their respective risk for fraud with manure based on 4 factors (Ministerie LNV, 2018).



Appendix B - Map of the South-East of the Netherlands, showing cases of manure fraud in recent years (Dohmen & Rosenberg, 2017a).



Appendix C - Graphs on export of manure and nitrate from the Netherlands in 2018, by destination and type (data retrieved from RVO 2019b).



9. List of References

- Bavel, M. van, Frouws, J. & Driessen, P. (2004, April). *Nederland en de Nitraatrichtlijn: Struisvogel of strategie?*. Retrieved from <http://library.wur.nl/WebQuery/wurpubs/332738>.
- Berry, E., Homewood, M.J., & Bogusz, B. (2017). *Complete EU Law*, Oxford: Oxford University Press.
- Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (BMU) (2017, January). *Nitratbericht 2016*. Retrieved from https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Binnengewasser/nitratbericht_2016_bf.pdf.
- Centraal Bureau voor Statistiek (CBS) (April 2019). *Landbouw; gewassen, dieren en grondgebruik naar hoofdgebruikstype, regio*. Retrieved from <https://opendata.cbs.nl/statline/#/CBS/nl/dataset/80783ned/table?dl=15236>.
- Dohmen, J. & Rosenberg, E. (2017a, November 10). Bedrijven in het grootste mestgebied in Nederland. *NRC Handelsblad*. Retrieved January 2019 from <https://www.nrc.nl/nieuws/2017/11/10/bedrijven-in-het-grootste-mestgebied-in-nederland-a1580350>.
- Dohmen, J. & Rosenberg, E. (2017b, November 10). Het Mestcomplot. *NRC Handelsblad*. Retrieved January 2019 from <https://www.nrc.nl/nieuws/2017/11/10/het-mestcomplot-a1580703>.
- Deutsche Welle (DW) (2018, June 21). *EU top court: Germany failed to curb nitrate levels in groundwater*. Retrieved from <https://p.dw.com/p/3005G>.
- Eerste Kamer der Staten-Generaal (2015, February). *Bijlage stand van zaken Actielijst Nederland – Noordrijn-Westfalen*. Retrieved from <https://zoek.officielebekendmakingen.nl/blg-457686>.
- European Commission (EC) (2010, January). *The EU Nitrates Directive*. Retrieved from <http://ec.europa.eu/environment/pubs/pdf/factsheets/nitrates.pdf>.
- European Commission (EC) (2016, 28 April). *Water: Commission refers GERMANY to the Court of Justice of the EU over water pollution caused by nitrates* [Press Release]. Retrieved from http://europa.eu/rapid/press-release_IP-16-1453_en.htm.
- European Commission (EC) (n.d.). *The common agricultural policy at a glance*. Retrieved from https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/cap-glance_en.
- European Court of Justice (Curia) (2003, 2 October). *Judgment of the Court - Case C-322/00*. Retrieved from <http://curia.europa.eu/juris/liste.jsf?language=en&num=C-322/00>.
- European Court of Justice (Curia) (2018, 21 June). *Judgement of the Court - Case C-543/16*. Retrieved from <http://curia.europa.eu/juris/celex.jsf?celex=62016CJ0543&lang1=en&type=TXT&ancre>.
- EUROSTAT (2017). *Livestock: number of farms and heads of animals of different types by agricultural size of farm (UAA) and NUTS 2 regions [ef_olsaareg]*. Location: EUROSTAT Data
- Fraters, B. et. al. (2011). *Developments in monitoring the effectiveness of the EU Nitrates Directive Action Programmes*. Retrieved from <https://www.rivm.nl/bibliotheek/rapporten/680717019.pdf>.

- Grinsven, H. van, Tiktak, A., & Rougoor, C.W. (2016). Evaluation of the Dutch implementation of the nitrates directive, water framework directive and the national emission ceilings directive. *Wageningen Journal of Life Sciences*, 78, 69-84.
- Grinsven, H. van, & Bleeker, A. (2017). *Evaluation of the Manure and Fertiliser Act 2016: Synthesis Report*. Retrieved from <https://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2017-evaluation-of-the-manure-and-fertilisers-act-2016-2779.pdf>.
- Heinen-Esser, U. (2018, September 5). *Illegale Gülleimporte* [Speech]. Retrieved from <https://www.landtag.nrw.de/portal/WWW/dokumentenarchiv/Dokument/MMA17-354.pdf>.
- Henkens, P.L.C.M., & Keulen, H. van (2001). Mineral policy in the Netherlands and nitrate policy within the European Community. *Wageningen Journal of Life Sciences*, 49, 117-134.
- Koeijer, T. de (2018, August). *Handelsverkeer in de mestmarkt: opties voor interventies*. Retrieved from <http://library.wur.nl/WebQuery/groenekennis/2244598>.
- Kreis Viersen (2018, August). *Nitratbelastung des Grundwassers im Kreis Viersen – Rahmenbedingungen, Ist-Situation und Handlungsfelder*. Retrieved from https://kis.kreis-viersen.de/sdnetrim/UGhVM0hpd2NXNFdFcExiZeDe5tP_3LUu8kH2mrW3STWjaodTZQvUsMOfMIPwktDS/1. Nitratstudie Endbericht Text.pdf.
- Kuhn, T. (2017). *The revision of the German Fertiliser Ordinance in 2017*. Retrieved from http://www.ilr.uni-bonn.de/agpo/publ/disap/download/disap17_02.pdf.
- Landtag Nordrhein-Westfalen. (2018). *Illegale Gülleimporte. 15.Sitzung Landtag Nordrhein-Westfalen*. Retrieved May 11, 2019, from <https://www.landtag.nrw.de/portal/WWW/dokumentenarchiv/Dokument/MMA17-354.pdf>.
- Lauwere, C. de (2016, December). *Agrarische ondernemers over de mestwetgeving*. Retrieved from <http://library.wur.nl/WebQuery/wurpubs/511367>.
- Leenstra, F. et al. (2014). Manure - A valuable resource. Retrieved April 25, 2019, from <http://library.wur.nl/WebQuery/wurpubs/451354>.
- Ma, L. et al. (2018, October). Nitrate and Nitrite in Health and Disease. *Aging and Disease*, 9 (5), 938 - 945. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6147587/pdf/ad-9-5-938.pdf>.
- Ministerie van Binnenlandse Zaken en Koninkrijksrelaties (BZK) (2017). *Grensoverschrijdende samenwerking*. Retrieved from https://kennisopenbaarbestuur.nl/media/256184/kaart_grensoverschrijdende_samenwerkingen_2017.jpg.
- Ministerie van Landbouw, Natuur en Voedselkwaliteit (LNV) (2018, October). *Versterkte Handhavingsstrategie Mest*. Retrieved from <https://www.rijksoverheid.nl/documenten/rapporten/2018/09/28/versterkte-handhavingsstrategie-mest>.
- Ministerie van Landbouw, Natuur en Voedselkwaliteit & Ministerie van Infrastructuur en Waterstaat (LNV & IM) (2017, December). *Zesde Nederlandse actieprogramma betreffende de Nitraatrichtlijn (2018–2021)*. Retrieved from <https://www.rijksoverheid.nl/documenten/rapporten/2017/12/22/zesde-nederlandse-actieprogramma-betreffende-de-nitraatrichtlijn-2018-2021/>.

- Müller, F., Bäbler, N., & Sailer, C. (2018). *Nitratbelastung des Grundwassers im Kreis Viersen – Rahmenbedingungen, Ist-Situation und Handlungsfelder* (Rep.). Kreis Viersen: Ahu AG Wasser · Boden · Geomatik, Aachen, from https://kis.kreis-viersen.de/sdnetrim/UGhVM0hpd2NXNFdFcExjZeDe5tP_3LUu8kH2mrW3STWjaodTZQvUsMOfMIPwktDS/1. Nitratstudie Endbericht Text.pdf.
- Neve, R., et al. (2016, December). *Dreigingsbeeld Milieucriminaliteit 2016*, p. 99 – 108. Retrieved from <https://www.politie.nl/themas/2017-dreigingsbeeld-milieucriminaliteit-2016.html>.
- OECD, Instrument Mixes for Environmental Policy (2007). OECD Publishing, 31.05.2007.
- Rijksdienst voor Ondernemend Nederland (RVO) (2019a, February). *Mestbeleid 2019 – 2021 Tabellen – Tabel 5*. Retrieved from <https://www.rvo.nl/onderwerpen/agrarisch-ondernemen/mestbeleid/mest/tabellen-en-publicaties/tabellen-en-normen>.
- Rijksdienst voor Ondernemend Nederland (RVO) (2019b, February). *Overzicht export dierlijke mest per jaar*. Retrieved from <https://www.rvo.nl/file/overzicht-export-dierlijke-mest-jaar>.
- Rijksdienst voor Ondernemend Nederland (RVO) (2019c, February). *Overzicht Vervoerders*. Retrieved from <https://www.rvo.nl/file/overzicht-vervoerders-februari-2019>.
- Rijksinstituut voor Volksgezondheid en Milieu (RIVM) (2017). *Water quality in the Netherlands; status (2012-2015) and trend (1992-2015)*. Retrieved from <https://www.rivm.nl/bibliotheek/rapporten/2017-0050.pdf>.
- Ronge, B. (2018, November 23). Illegale Gülle Entsorgung im Kreis Viersen: Gülle-Razzia in den Niederlanden. *Rheinische Post*. Retrieved April 2019, from https://rp-online.de/nrw/staedte/viersen/kreis-viersen-guelle-razzia-in-den-niederlanden_aid-34628971.
- Taube, F., Balmann, A., Bauhus, J. (2013, September). *Amendment of the Fertilizer Ordinance: Effectively restricting nutrient excesses*. Retrieved from https://www.researchgate.net/publication/290091964_Amendment_of_the_Fertilizer_Ordinance_Effectively_restricting_nutrient_excesses.
- Tuenter, G. (2016, November). Met meer melk kwam er meer mest, te veel mest. *NRC Handelsblad*. Retrieved March 2019 from <https://www.nrc.nl/nieuws/2016/11/21/met-meer-melk-kwam-er-meer-mest-te-veel-mest-5397382-a1532900>.
- Umweltamtrat (2015, May). *The implementation of the Water Framework Directive in Germany with regard to nitrogen inputs from agriculture*. Retrieved from https://www.umweltrat.de/SharedDocs/Downloads/EN/02_Special_Reports/2012_2016/2015_06_part_translation_implementation_water_framework_Directive.pdf?blob=publicationFile&v=2.
- Willems, W.J., Schoumans, O.F. & Velthof, G.L. (2013). *Implementation of the Nitrate Directive in the Netherlands; Role of stakeholders, politicians and research*. Retrieved from http://www.luwq2013.nl/upload/242_Willems_et_al_Role_of_stakeholders_politicians_Nitrate_Directive_Netherlands.pdf.

ITEM is an initiative of Maastricht University (UM), the Dutch Centre of Expertise and Innovation on Demographic Changes (NEIMED), Zuyd Hogeschool, the city of Maastricht, the Meuse-Rhine Euregion (EMR) and the (Dutch) Province of Limburg.

Institute for Transnational and Euregional
cross border cooperation and Mobility / ITEM

Mailing address:

Postbus 616, 6200 MD Maastricht, The Netherlands

Visitors:

Bouillonstraat 1-3, 6211 LH Maastricht, The Netherlands

Avenue Céramique 50, 6221 KV Maastricht, The Netherlands

T: 0031 (0) 43 388 32 33

E: item@maastrichtuniversity.nl

www.twitter.com/ITEM_UM

ITEM Cross-Border Portal:

<https://itemcrossborderportal.maastrichtuniversity.nl/p/homepage>

