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legal framework

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IFRO Report

Comparison of ammonia regulation in Germany, the Netherlands and Denmark – legal framework

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This report has been elaborated as part of a comparative project initiated by the Danish Environmental Protection Agency, the Ministry of Environment and Food. The project has the purpose to compare the ammonia regulation of livestock installations with a particular view to Natura 2000 sites and the EU Habitats Directive. The project as a whole consists of three parts analysing the situation in Denmark, Germany – with a particular focus on Schleswig-Holstein – and the Netherlands from a legal perspective, an economic perspective and a natural science perspective. This particular report compares the legal framework in Denmark, Germany and the Netherlands.

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1. Summary and overview

This comparative report is based on the findings in three national reports from Denmark (DK), Germany (D) and the Netherlands (NL) elaborated as part of a study of ammonia regulation of livestock installations with a particular regard to Natura 2000 sites and the Habitats Directive (HD).[1] The main focus in the report is on livestock installations, whereas the regulation regarding the spreading of manure is not elaborated upon, apart from a short note on manure spreading techniques.

The national reports indicate certain variations in the ammonia regulation in Germany, the Netherlands and Denmark respectively. While all three countries are facing issues regarding terrestrial Natura 2000 habitats sensitive to eutrophication by ammonia or nitrogen, the legal approaches to addressing ammonia emissions from livestock installations are somewhat different and not easy to compare.

In Denmark the regulation is centred around the individual environmental permits required for almost all livestock installations, although the assessment and permit criteria have to some extent been standardised as regards so-called "ammonia sensitive" habitats, including also areas outside Natura 2000 sites.

In Germany a Natura 2000 assessment is linked to different permit procedures, including building permits as the thresholds for environmental permits are relatively high. The criteria regarding "ammonia or nitrogen sensitive" habitats have also to some extent been standardised following court rulings laying down certain thresholds. These thresholds are incorporated into a proposed amendment of the so-called TA Luft standards to be applied in permit procedures.[2]

In the Netherlands a novel approach has been adopted in 2015 in the form of the so-called programmatic (or integrated) approach to nitrogen/ammonia (Programmatische Aanpak Stikstof - PAS). This approach seeks to deal with the assessment requirements of the Habitats Directive Art. 6(3) at a "programmatic" level considering general reduction trends as well as (planned) nature management and restoration measures with the purpose to stabilize and in the end improve the conservation status of Natura 2000 areas and to establish a "room for development" for subsequent permits. The Dutch approach and its compliance with the Habitats Directive has been challenged and a preliminary reference has been made to the Court of Justice of the European Union (CJEU).

While environmental permit requirements apply to almost all livestock installations in Denmark, environmental permits are in the Netherlands only required for large pig and poultry installations in accordance with the EU Industrial Emissions Directive (IED). Other permits, including Natura 2000 permits, may however be required in the Netherlands. In Germany, a simplified environmental permit applies to livestock installations below the IED thresholds, but above other thresholds. Other livestock installations

[1] This includes three reports on the national legal framework: S. Möckel, Germany - national report on the legal framework for ammonia regulation of livestock installations with a particular regard to Natura 2000-sites (hereafter Möckel, 2017); C. Backes & A. Keessen, The Netherlands – national report on the legal framework for ammonia regulation of livestock installations with a particular regard to Natura 2000-sites (hereafter Backes & Keessen, 2017), H.T. Anker & L. Baaner, Denmark - national report on the legal framework for ammonia regulation of livestock installations with a particular regard to Natura 2000-sites (hereafter Anker & Baaner 2017) and two other reports on economic analyses: H. Luesink & R. Michels, Ammonia regulations regulations near nature areas in Denmark and the Netherlands compared (hereafter Luesink & Michels, 2017) and U. Latacz-Lohmann, Economic analysis of ammonia regulation in Germany (Schleswig-Holstein) in relation to the Habitat Directive (hereafter Latacz-Lohmann, 2017).

[2] Technical Guidelines for the Prevention of Air Pollution (TA Luft 2002).

are subject to building permits in Germany, which may also include the consideration of nature protection and environmental issues.

Different approaches are also displayed as regards existing livestock installations that do not apply for a permit for expansion or other changes. In the Netherlands existing livestock installations appear to be accounted for in the PAS-model, meaning that the activities are not subject to any further permit or assessment requirements as regards their potential (adverse) effects on Natura 2000 habitats and species. Existing stables, are, however subject to general emission reduction requirements – although with a transition period. In Denmark some existing livestock installations will be subject to a reconsideration or update of their permit which will invoke the ammonia standards laid down in the Livestock Installations Act. Otherwise existing installations can be subject to an individual order imposing e.g. ammonia emission reductions. There are, however, no known examples of such orders. In Germany, existing livestock installations with potential adverse effects on Natura 2000 sites may also be subject to individual orders. As regards large pig and poultry livestock installations subject to the requirements of the EU Industrial Emissions Directive (IED) it must be ensured that existing installations will comply with the EU BAT-conclusions. Furthermore, it must be assumed that the IED installations shall be subject to a reconsideration or update of their permit in accordance with the IE Directive both in Germany and the Netherlands.

While in Denmark and Germany livestock installations are primarily subject to emission limit and technology requirements when they apply for a permit, in the Netherlands general standards apply to all livestock installations in the Decree on Low Emission Stables although with a transition period for existing stables. Certain general technology standards do, however, also apply to non-permit installations in Germany (so-called "operator obligations") and in Denmark.

Finally, the extent to which other "ammonia or nitrogen sensitive" habitats than those within Natura 2000 sites may lead to restrictions on livestock installations also varies. In Denmark the permit procedure for livestock installations includes the consideration of "ammonia sensitive" habitats outside Natura 2000 sites – the so-called category 2 and 3 habitats. In addition, an individual assessment must be made with regard to breeding and resting sites of Annex IV species and also other protected habitats sensitive to ammonia deposition can be examined as part of the permit procedure, e.g. lakes or ponds above 100 m^2. In Germany, the impact on other sensitive ecosystems may also be considered as part of a permit for livestock installations if the ammonia deposition will exceed the cut-off or *de minimis* thresholds. The deposition of ammonia also contributes to acidification of the soils and habitats, and in the Netherlands, the provinces designate areas sensitive to acidification both within and outside Natura 2000 sites.[3] On the basis of the Livestock and Ammonia Act, a general distance requirement of 250 m applies around these areas sensitive to acidification.

[3] This concerns areas which are part of the "Ecologische Hoofdstructuur" (EHS, now called Natuur Netwerk Nederland, NNN, National Ecological Network). The NNN consists of the Natura 2000 areas and other areas, designated by the provinces.

2. Implementation of the EU Habitats Directive

2.1. General legal framework

Implementation of the EU Habitats and Birds Directives[4] appears to have been difficult in all three countries. Denmark and the Netherlands only recently appear to have established a full transposition of the Habitats Directive into national legislation.[5] In Germany, the split in legislative powers between the federal and state level makes it difficult to get a full picture as regards the formal transposition. In this report the main focus is on the implementation of the requirements of Art. 6(3) of the Habitats Directive on the assessment and permit obligations regarding new or amended projects and plans. A short account is also made as regards the implementation of Art. 6(1) on management measures to restore or maintain a favourable conservation and Art. 6(2) regarding non-deterioration of habitat types or habitats of species, e.g. by restricting existing harmful activities.

The Netherlands has for a number of years relied on the direct application of the directives by courts and administrative authorities. Most of the legal gaps have been filled by an amendment of the Nature Protection Act in 2005. Furthermore, the Netherlands employ a national policy aiming at a minimum implementation of EU legislation.[6] In January 2017 a new Nature Protection Act (2017) came into force. This Act ensures a correct transposition of the Habitats and Birds Directives. Yet, other legislative initiatives – such as the Integrated Approach to Nitrogen (PAS) – remain controversial in relation to the compliance with the EU directives and a preliminary reference is currently pending before the Court of Justice of the European Union.[7]

In Germany the legislative powers regarding nature protection are split between the federal and state level. In general, species protection is subject to federal legislation only, whereas protection of habitats, including Natura 2000 sites, is both a federal and a state matter. Federal legislation, Bundesnaturschutzgesetz (BNatSchG), obliges the Federal Government as well as the Länder to implement all Natura 2000 related provisions of the Habitats Directive. Art. 6(2) of the Habitats Directive is implemented in the form of a general binding ban on deterioration (BNatSchG Art. 33(1)), while Art. 6(3) (and 6(4)) are implemented in the so-called "compatibility assessment" requirement of BNatSchG Art. 34-36. The Länder are responsible for selecting and designating terrestrial Natura 2000 sites and for the protection of Natura 2000 sites. It appears that there are some deficiencies regarding the designation as protected sites and the establishment of conservation measures in accordance with Art. 6(1) of the Habitats Directive as well as Art. 4(4) of the Birds Directive and an infringement procedure was initiated by the EU Commission in 2015.[8] In Schleswig-Holstein (SH) the designation process is completed, but there appears to be deficits in management measures.[9]

In Denmark the transposition of the Habitats Directive is scattered across a number of different pieces of legislation that gradually have been adjusted to ensure a correct transposition of e.g. Art. 6. In general, the

[4] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora **,** OJ L 206, 22/07/1992, p. 7-50 and Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds**,** OJ L 20, 26.1.2010, p. 7–25.
[5] Backes & Keesen p. 3.
[6] Backes & Keesen p. 3. See also Squintani, L., 2013. The Dutch policy on gold-plating and the transposition of Directive 2008/98/EC on waste, ELNI Review 1+2/2013 pp. 44-50.
[7] C-294/17 *Stichting Werkgroep Behoud de Peel*.
[8] Infringement case 2014/2262.
[9] Möckel, 2017 p. 6.

designation of Natura 2000 sites as well as the (pro-)active protection and management of the sites (Art. 6(1)) is governed by the Act on Environmental Objectives, whereas the requirements to restrict existing harmful activities mainly relies on the Nature Protection Act as well as other relevant legislation. Finally, the obligation to ensure an appropriate assessment of potential effects of (new) projects or activities is mainly embedded in Executive Order 926/2016 linking the assessment requirement to different permit procedures in the relevant legislation. Executive Order 926/2016 also establishes a requirement to avoid destruction or deterioration of breeding or resting places for Annex IV species when granting a permit. This is combined with a general prohibition in the Nature Protection Act.

Table 1: General legal framework regarding Natura 2000 sites and the Habitats Directive Art. 6.

	Denmark	Germany	Netherlands
Natura 2000 sites	• 252 sites • 8% of land area • 17% of marine area	• 5,211 sites (SH: 311 sites) • 15% of land area • 41% of marine area	• 166 sites • 13% of land area • 20% of marine area
HD Art. 6(1)	• Natura 2000 plans + (pro-active) measures	• Optional management plans (Länder level)	• Natura 2000 management plans, including regulation of existing and new activities
HD Art. 6(2)	• Natura 2000 plans • Agreements or orders	• General prohibition (significant impairment)	• Natura 2000 management plans, including regulation of existing and new activities
HD Art. 6(3)	• Natura 2000 assessments – part of permit procedure	• Natura 2000 assessments – part of permit procedure	• Natura 2000 assessments – part of Natura 2000 permit or integrated permit • PAS
Annex IV species	• Assessment requirement in permit procedures (incl. livestock installations) • General prohibition	• General prohibition	• General prohibition

2.2. Designation of Natura 2000 sites

Natura 2000 sites have been designated in all three countries covering a land area of respectively 8 % (DK), 13 % (NL) and 15 % (DE). In the Netherlands the land area includes large inland waters, including closed sea inlets. Furthermore, there have been controversies regarding the designations and some designations are still pending in the Netherlands. A preliminary reference was made to the Court of Justice of the European Union regarding the decision (with the approval from the European Commission) to reduce the size of a Natura 2000 site (Haringvliet-Leenheerenpolder). The Court of Justice of the European Union has ruled that the amendment by the Commission of the EU list of areas to be designated, according to which the Leenheerenpolder would not have to be designated, infringed EU law and therefore is not valid.[10]

All three countries also address so-called “ammonia” or “nitrogen” sensitive habitats within the Natura 2000 sites. In Germany and the Netherlands the “sensitivity” appears to be based on the critical load of the habitats. In the Netherlands, a total of 118 Natura 2000 sites have been identified as being designated for

[10] C-281/16, ECLI:EU:C:2017:774, Judgment of 19 October 2017.

the protection of habitats sensitive to nitrogen. In all these areas the calculated background deposition of ammonia is higher than the critical load of the respective habitat type.[11] In Germany, there appears to be no official information on the actual number of areas concerned, but information is available on critical loads and the extent to which the critical loads are exceeded.[12] In Denmark the identification of "ammonia sensitive" habitats is based on a general assessment of the habitat type, e.g. the 43 out of the 59 habitat types present in Denmark and other habitats outside Natura 2000 sites. In Germany and the Netherlands the "nitrogen sensitive" habitats are not only designated with regard to agricultural pollution, but more generally to nitrogen pollution from different sources. In Denmark, on the other hand, the concept of "ammonia sensitive" habitats is linked to the regulation of livestock installations and agricultural pollution only. The sensitivity of Natura 2000 habitats to nitrogen or ammonia depositions shall, however, also be considered in permit procedures for other polluting activities, such as power plants. This will be done on a case by case basis and the assessment criteria have not been standardised as is the case for livestock installations.

2.3. Active management and existing activities – Habitats Directive Art. 6(1) and 6(2)

According to Art. 6(1) of the Habitats Directive the Member States are required to establish the necessary conservation measures with the purpose to maintain or restore a favourable conservation status for the habitats and species. To what extent the favourable conservation status shall be met at site level or at national level does not follow clearly from the Habitats Directive. The Netherlands gained the acceptance of the European Commission to adopt a strategy whereby favourable conservation status is to be achieved at the national level, and not necessarily at each site. Whether this is fully in compliance with the Habitats Directive as interpreted by the CJEU remains unresolved.[13]

Art. 6(1) is closely related to Art. 6(2) – the no-deterioration principle – which mainly applies to existing (harmful) activities. Thus, (pro-)active management measures and restrictions may be necessary to address ammonia pollution from ongoing activities or otherwise to restore degraded habitats.

Natura 2000 management plans are mandatory in Denmark and the Netherlands, while it in Germany is an option for the länder whether to use management plans or not. In Schleswig-Holstein Art. 27(1) LNatSchG obliges the competent nature conservation authority to enact management plans under public participation, if it is necessary. In Germany, the decision to designate a site may include provisions regarding existing and new activities. The Dutch Natura 2000 management plans can have a regulatory function, both as regards existing and new activities. Thus, if an activity is explicitly approved in a management plan, the general permit requirement of the Nature Protection Act does not apply. It appears, however, that it has been difficult to address ammonia pollution from agriculture in the Dutch management plans and the management plans have been awaiting the Integrated Approach to Nitrogen (PAS).[14] In Denmark, ammonia pollution from livestock installations is not addressed in the Natura 2000 plans as they simply refer to ammonia pollution as being regulated under the Livestock Installations Act. However, in Denmark (and in the Netherlands) more proactive measures can be part of the management plans seeking to mitigate the adverse effects of ammonia pollution. The regulation of existing or ongoing

[11] Backes & Keessen, 2017 p. 6.
[12] Möckel, 2017 fig. 7 and UBA, 2015 p. 7
[13] Schoukens, 2017 p. 485 argues that favourable status also needs to be achieved at site level, especially in cases where the overall status is unfavourable at national level.
[14] Backes & Keessen, 2017 p. 7.

activities such as existing livestock installations and stables is regulated in different ways in the three countries, see further below Section 4.

2.4. Natura 2000 assessments – Habitats Directive art. 6(3)

According to Art. 6(3) of the Habitats Directive any plan or project likely to have a significant effect, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives - a Natura 2000 or habitat assessment. Article 6(3) thus includes first a screening to determine whether a significant effect can be excluded, and secondly a (full) assessment of the effects if a significant effect cannot be excluded. Finally, it must be determined whether a permit can be granted or not. A permit can as stipulated in Art. 6(3) be granted only after "having ascertained that it will not adversely affect the integrity of the site concerned."

When it comes to new projects in the form of livestock installations[15] all three countries have made attempts to address the particular problems related to ammonia emissions from livestock installations in the vicinity of Natura 2000 sites sensitive to ammonia or airborne nitrogen compounds. The assessment and permit requirements of Art. 6(3) are implemented in different ways in the three countries. Denmark and Germany have a somewhat similar approach linking Natura 2000 assessments to permit procedures, e.g. environmental permits or building permits. The Netherlands has with the so-called PAS (Programmatische Aanpak Stikstof) taken another – so-called "programmatic" – approach to ammonia pollution in general. The Dutch approach is controversial in view of the requirements of the Habitats Directive and a preliminary reference has been made to the Court of Justice of the European Union. Thus, it remains uncertain to what extent PAS is in compliance with the Habitats Directive. While the PAS primarily is used to facilitate (anticipated) compliance with Art. 6(3) for new projects, it must be viewed in combination with other instruments such as the general minimum distance of 250 m for the establishment of new livestock installations in the Ammonia and Livestock Installations Act, see further below section 4.

The Dutch PAS model that became operational on 1 July 2015 aims to avoid further deterioration and to contribute to the achievement of a favourable conservation status for nitrogen sensitive Natura 2000 sites. At the same time PAS aims to enable economic development. PAS is a national plan based on a model – AERIUS Calculator – that calculates depositions for a 1 ha grid. It takes into account expected reduction of N-deposition as well as an additional deposition resulting from an annual economic growth of 2.5%. On the basis of the calculations, a "room for economic development" can be identified for each Natura 2000 site. The expected reduction of N-deposition is based on so-called "generic source measures" implementing existing policies and an additional "package" on measures agreed with the agricultural sector, e.g. gas scrubbers, manure application techniques etc. These measures are estimated to provide a 9% reduction of agricultural emissions by 2030 compared to 2013.[16] Furthermore, ecological restoration measures in the 118 Natura 2000 sites containing "nitrogen sensitive" habitats are taken into account, e.g. removal of top soil layers or hydrological measures. Site analyses have been carried out to demonstrate that there would be at least no further degradation of habitat quality. The PAS also includes a monitoring system that should guarantee that Natura 2000 objectives will not become threatened by the PAS model.

Thus, as a programme, the PAS has been subject to an impact assessment to demonstrate that all the projects it comprises will not have any significant adverse effects on any of the 118 nitrogen sensitive

[15] The extent to which other agricultural activities are regarded as projects in the context of Art. 6(3) appears to vary in the three countries. This will not, however, be elaborated further in this report.
[16] de Heer et al., 2017 p. 102.

Natura 2000 sites. According to PAS, existing activities, e.g. livestock installations, as well as new projects with an ammonia emission resulting in a model-based theoretical additional deposition on a sensitive habitat below 1 mol N/ha/year (0,014 kg N/ha/year) do not need a permit – they are authorized through the PAS programme. New projects with an ammonia emission resulting in an additional calculated deposition above 1 mol N/ha/year need a permit (and Natura 2000 assessment) in accordance with the Nature Protection Act 2017. They can obtain a permit if there is (still) some "room for development" within the Natura 2000-site. If 95 % or more of the "room for development" has been used the cut-off threshold for not needing a permit will be lowered to 0,05 mol N/ha/year (0,0007 kg N/ha/year). While these cut-off thresholds are very strict – and rather theoretical – it must be kept in mind that they relate to the additional load from the project in question.

The PAS has been challenged in the Dutch courts on grounds that it is not in accordance with the Habitats Directive. Two pilot cases – one on several livestock installations and one on cattle grazing and manure spreading – have jointly been submitted for a preliminary ruling by the Court of Justice of the European Union (C-294/17). It appears that the Judicial Division of the Dutch Council of State has taken the view that PAS can exclude certain categories of activities from an individual screening or assessment requirement as an assessment has been carried out at the strategic programme level. The Judicial Division also appears inclined to accept that the predicted general reduction in ammonia emissions as well as the effects of conservation measures can be taken into account in the PAS.[17]

In Germany the potential effects on Natura 2000 sites must be assessed for all projects in accordance with the BNatSchG Sec. 34. There are no minimum threshold sizes for projects regarding the assessment of compatibility with Art. 6(3) and the protection of Natura 2000 sites.[18] If a project does not require authorization, it must be notified.[19] A Natura 2000 assessment is carried out by the competent immission control or building authority. Certain screening criteria have been established by the German courts. If Natura 2000 sites contain "nitrogen sensitive" habitats or species, significant effect is according to the German courts likely, if the Critical Load (CL) regarding ammonia deposition for these habitats or species is exceeded. However, so-called cut-off or *de minimis* criteria regarding the possible exclusion of significant effects have been laid down in Fachkonventionen (guidance documents of the best knowledge in the field) in accordance with rulings of the German courts. Fachkonventionen are not legally binding, but provide assistance to the competent authorities in the assessment in accordance with the guidance and court rulings. In general, a screening will be carried out with the purpose to determine whether a full assessment is required. If the background load, together with the additional load from the project and from cumulative projects and plans stays within the critical load, the project is considered not to have a significant impact. Independent of whether the critical load is exceeded or not, a project is not considered to have a significant impact if the additional load is below 0,3 kg N/ha/year (cut-off threshold). Furthermore, if the cumulative load is below 3% of the critical load the project is not considered to have a significant impact either (*de minimis* threshold). The 3% *de minimis* threshold must include all cumulative projects approved. If these cut-off or *de minimis* thresholds are exceeded significant effects are assumed and a full assessment must be carried out. It will then be up to the applicant or project developer to propose emission abatement

[17] Backes & Keessen p. 13.

[18] The German legislation refers to a compatibility assessment or an FFH (Fauna-Flora-Habitatrichtlinie) compatibility assessment, Möckel, 2017 p. 8.

[19] Measures of agricultural land use are, however, not projects requiring notification if they meet requirements of good professional guidance. This is criticized in literature. See Möckel, 2017 p. 30.

measures that can keep the load within the thresholds. Otherwise, a permit must be rejected.[20] If specific critical loads have not been established a site-specific assessment must be carried out. The case law based cut-off and *de minimis* thresholds will be incorporated in the revised TA Luft regarding Natura 2000 sites, see below.

In Denmark, the Natura 2000 assessment is closely linked to permit procedures, for livestock installations the environmental permit in accordance with the Livestock Installations Act. An environmental permit is required for the establishment or amendment/enlargement of livestock installations with a production area above 100 m^2. The Livestock Installations Act (and Executive Order 916/2017) defines three categories of "ammonia sensitive" habitats, whereof only category 1 is located within Natura 2000 sites. Category 1 habitats comprise 43 out of the 59 habitat types present in Denmark as well as two other types of protected habitats. According to Livestock Installations Act specific permit thresholds apply for livestock installations that are located in the vicinity to category 1 habitats, see further below 4.2.2 on the criteria regarding category 2 and 3 habitats. The category 1 criteria apply to the total load, i.e. the ammonia deposition from the new/amended installation as well as the existing installation. Furthermore, the cumulative effects from nearby livestock installations must be taken into account. This is done in a standardised way. When a permit is granted, the maximum allowable ammonia deposition on a category 1 habitat is 0,7 kg N/ha/year if there are no other farms nearby; 0,4 kg N/ha/year if there is one other farm in the vicinity; and 0,2 kg N/ha/year if there is more than one other farm in the vicinity. In addition to category 1 habitats it cannot be ruled out that the effects on other ammonia sensitive nature types or Annex IV species must be assessed on an individual basis in the permit procedure, cf. Executive Order 926/2016.[21]

When comparing the thresholds regarding ammonia deposition from amended or expanded livestock installations to ammonia or nitrogen sensitive habitats it is important to note whether they relate to the *additional load* compared to existing installation *or the total load* from the entire livestock installation after the amendment or expansion. In this respect the Danish deposition thresholds for category 1 habitats refer to the total load, while the German and Dutch thresholds refer to the additional load from the project in question, e.g. an enlargement of the production. This has, however, been debated in Germany in view of the requirements of the Habitats Directive.[22] It can be noted that in the proposed amendment of TA Luft the reference to additional load ("Zusatzbelastung") has generally been replaced by total load from the installation ("Gesamtzusatzbelastung"). It is, however, not clear whether this is also linked to the 0,3 kg N/ha/year cut-off criterion or only to the 3 % *de minimis* criterion and other criteria. There also appears to be some variations in practice. In Schleswig-Holstein the load from the existing installation is apparently included in the calculation to the extent that it relates to activities initiated after the Natura 2000-designation also in relation to the 0,3 kg N/ha/year cut-off criterion.[23]

It is also important whether *cumulative effects* from other installations or predicted installations are taken into account or not – this is the case in Denmark. In Germany existing installations are part of the background load, while new projects and plans that are permitted, but not realised, must be taken into account as cumulative projects in a permit procedure as regards the *de minimis* criterion of 3 % of the

[20] It appears that an option exists to examine whether certain assessment values of the particular habitat are exceeded, see Latacz-Lohmann, 2017 p. 21.
[21] Anker & Baaner, 2017 p. 23.
[22] Möckel, S., 2017a. The assessment of significant effects on the integrity of "Natura 2000" sites under Article 6(2) and 6(3) of the Habitats Directive, Nature Conservation 23: 57-85.
[23] Latacz-Lohmann, 2017 p. 42.

Critical Load. In the Netherlands, the PAS model implies that existing farms as included in the background load will not affect the assessment of individual projects. Prior to the PAS, cumulative effects were taken into account and were applied very strictly by referring to the critical load.

Furthermore, it is important to note whether the thresholds are used to determine whether an assessment or a permit is required (screening/assessment thresholds), or whether they determine when a permit can be granted (permit thresholds). The latter applies in Denmark where a permit cannot be granted if the thresholds are exceeded. In Germany, the criteria have been developed by the courts as screening criteria to determine whether significant effects can be excluded. At the same time they also appear to function as thresholds for when a permit can be granted, although a permit might not be excluded even though the criteria have not been complied with. In the Netherlands, the additional deposition of 1 mol N/ha/year (or 0,05 mol N/ha/year) is a threshold that determines whether a permit is needed or not, i.e. a screening threshold. Thus, a permit is required (and can be granted) when the threshold is exceeded – depending, however, on the availability of any "room for development" for the specific site.

These differences should be kept in mind when reading the table below and in any attempts to draw comparisons. Furthermore, it appears that calculations of deposition or even of critical loads may vary significantly. Thus, caution should be taken when trying to compare the thresholds.

Table 2: Natura 2000 screening or permit criteria regarding ammonia/nitrogen

Denmark	Germany	Netherlands
"Ammonia sensitive" habitats (category 1 – Livestock Installations Act) Screening/assessment thresholds: see permit thresholds Permit thresholds: • Total load below 0,2-0,7 kg N/ha/year (cumulation model)	Critical Loads (CL) for "nitrogen sensitive" habitats and species (not binding) Screening/assessment thresholds (no significant effects are assumed and no further assessment needed): • Additional load below 0,3 kg N/ha/year (cut-off), or • Cumulative "additional" load below 3% of CL (de minimis) Permit thresholds: see above (Fachkonventionen and court decisions – to be incorporated into revised TA Luft with some amendments as regards "additional load")	PAS ("nitrogen sensitive" habitats): Screening/assessment threshold (no assessment or permit requirement): • Additional load below 0,014 kg N/ha/year (or 0,0007 kg N/ha/year if no "room for development") Permit thresholds: • within "room for development" NB: 250 m prohibition zone around areas sensitive to acidification: no new establishment, but amendments/enlargements can be accepted if no increase in total emission (Ammonia and Livestock Installations Act)

3. Ammonia regulation in general

Ammonia emissions in all three countries originate mainly from agriculture. It is estimated that respectively 96 % (DK), 95 % (DE) and 85-90 % (NL) is related to agriculture. Thus, there is a certain focus on ammonia emissions from agriculture in particular in relation to the achievement of the emission ceilings established under the Gothenburg Protocol and the NEC and NERC Directives.[24]

Table 3: NEC/NECR reduction requirements and emission ceilings

	Denmark		Germany		Netherlands	
	Reduction percentage	Emission ceiling (total kt)	Reduction percentage	Emission ceiling (total kt)	Reduction percentage	Emission ceiling (total kt)
2010	43% of 1990 level	69 kt	25% of 1990 level	550 kt	36% of 1990 level	128 kt
2020	24% of 2005 level	67 kt	5% of 2005 level	644 kt	13% of 2005 level	135 kt
2030	24% of 2005 level	67 kt	29% of 2005 level	482 kt	21% of 2005 level	123 kt

Source: European Environment Agency - Data and maps: National Emission Ceilings Directive emissions data viewer, https://www.eea.europa.eu/data-and-maps/dashboards/necd-directive-data-viewer.

In Denmark an Ammonia Action Plan was presented in 2001 with the purpose achieve the 2010 reduction target as well as to protect Natura 2000 sites. It identified a number of measures related to livestock installations, manure storage, spreading of manure etc. that were subsequently incorporated into legislation. In 2007 a new Act on Environmental Permits for Livestock Installations was adopted introducing two different sets of buffer zone requirements: 1) a 300 m buffer zone around specific habitat types prohibiting additional ammonia pollution from new or amended livestock installations (above 15 animal units); and 2) a 300-1000 m buffer zone where specific criteria applied regarding the additional load from new or amended livestock installations. Furthermore, a general ammonia emission reduction requirement for new or amended livestock installations was introduced. The ammonia regulation in the Act on Environmental Permits for Livestock Installations was in 2011 replaced by a set of new rules combining the general ammonia emission reduction requirement with more specific total ammonia thresholds to be applied in the permit procedures for establishing or amendment of livestock installations, see further below.

In the Netherlands, different policy instruments have been used to address the issue of ammonia pollution from livestock installations. This includes the use of spatial planning where livestock farms were only allowed in so-called concentration areas designated by the provinces considering the distance to vulnerable nature areas. This so-called “Reconstruction Act” was, however, repealed in 2014. Another important

[24] Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants (NEC Directive) will be repealed by 1st July 2018 by Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, OJ L 344, 17.12.2016, p. 1–31 (NERC Directive).

instrument is the regulation on phosphate and production rights which aims at stabilizing and reducing the number of livestock animals in the Netherlands. The phosphate rights are primarily aimed at ensuring compliance with the EU Nitrates Directive, but will also reduce ammonia emissions. The phosphate rights will from 1st January 2018 impose a reduction of the amount of cattle in the Netherlands. The issuance of provisional rules in February 2017 (Ministerial Decree Phosphate Reduction Plan 2017) has, however, been challenged before the Dutch courts with reference to infringement of private property rights. More specific regulation regarding ammonia emissions is - apart from the PAS regulation – mainly based on the Livestock and Ammonia Act (2002)[25] and the Decree on Low Emission Stables (2013/2015) imposing distance requirements (buffer zones) as well as other emission reduction measures on livestock installations.

In Germany it appears that there has so far not been a strong legislative focus on regulating and reducing ammonia emissions from agriculture although some requirements have been specified in the federal Technical Guidelines for the Prevention of Air Pollution (TA Luft 2002). TA Luft is an administrative regulation that is mandatory in permit procedures of the competent authorities and it also specifies legal duties for installations, which do not need an environmental permit, but are subject to the Bundesimmissionsschutzgesetz (BImSchG). Thus, TA Luft contains more indirectly binding obligations. Some states have adopted their own administrative regulations, including Schleswig-Holstein which in 2014 adopted a so-called Filter Decree. A proposal for a new TA Luft (2017) has been put forward that is based on the ammonia thresholds and criteria regarding Natura 2000 sites developed through the decisions of the German courts and the so-called Fachkonventionen.

[25] The Livestock and Ammonia Act has several times been extensively amended, lastly amended 11 October 2016.

4. Livestock regulation and ammonia sensitive areas

4.1 Environmental permits and other permit and assessment requirements

According to the EU Industrial Emissions Directive (IED)[26] intensive pig and poultry installations above a certain size limit must be subject to an environmental permit. The permit thresholds of the IED are: more than 40,000 places for poultry, more than 2,000 places for production (or fattening) pigs (over 30 kg) or more than 750 places for sows. A permit shall amongst others be based on the best available techniques and the so-called BAT conclusions adopted by the European Commission shall be the reference for setting the permit conditions, including emission limit values. The competent authority may, however, set stricter permit conditions than those achievable by the use of the best available techniques as described in the BAT conclusions. The IED BAT conclusions[27] refer to different techniques regarding ammonia emissions and stipulate ammonia emissions limits for different types of pig and poultry rearing installations, ranging from 0,01-0,08 kg NH_3/animal place/year (broilers) to 0,2-2,7 kg NH_3/animal place/year (mating and gestating sows). If an environmental quality standard requires stricter conditions than those achievable by the use of best available techniques, the competent authority is obliged to include additional measures in the permit – the so-called combined method, cf. IED Art. 18.

In Denmark, livestock installations have since 2007 been subject to a comprehensive environmental permit scheme as laid down in the Livestock Installations Act.[28] The Act applies to small as well as large livestock installations and includes all types of livestock. It combines implementation of the IED and the EIA Directive.[29]

The Livestock Installations Act was amended in February 2017[30] and a new permit scheme entered into force by 1 August 2017. The permit thresholds are summarised in table 4 below. The new permit scheme introduces new permit thresholds based on the size of the production area as opposed to the number of animals based on so-called animal units (AU) in the 2007 legislation.[31] According to the new rules a livestock installation with more than 100 m^2 of production area (e.g. stables etc.) will be subject to a permit requirement (Sec. 16b). If the livestock installation has an ammonia emission above 3,500 kg NH_3-N/year or is above the permit thresholds of the IE Directive a more comprehensive permit is required (Sec. 16a).

According to the German legislation two permit systems exists for livestock installations. An environmental permit – regular or simplified - is required under the Bundes-immissionsschutzgesetz (BImSchG) for larger livestock installations. The environmental permit includes other permits under e.g. nature conservation and building legislation, but not water related permits. For smaller stables only a building permit is required in accordance with state building regulations. A Natura 2000 assessment or an EIA (environmental impact

[26] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control), OJ L 334, 17.12.2010, p. 17–119.
[27] Commission Implementing Decision (EU) 2017/302 of 15 February 2017 establishing best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for the intensive rearing of poultry or pigs (notified under document C(2017) 688), C/2017/0688, OJ L 43, 21.2.2017, p. 231–279.
[28] Consolidated Act no. 256 of 21. March 2017 (bekendtgørelse af lov om husdyrbrug og anvendelse af gødning m.v.).
[29] Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment, OJ L 26, 28.1.2012, p. 1–21
[30] Act no. 204 of 28 February 2017.
[31] One animal unit (AU) was as a main rule equivalent to 100 kg N “ex stock” (ab storage), but a detailed list of number of animals of different types per AU was provided in Executive Order 1324/2016.

assessment) may be required as part of either the environmental permit or the building permit procedure. Specific thresholds apply for livestock installations under the federal EIA legislation.[32]

The environmental permit distinguishes between a regular procedure, including public participation, and a simplified procedure. The regular procedure applies to IED livestock installations as well as fur farm installations with more than 1,000 places and piglet installations with more than 6,000 piglets. The simplified procedure applies to installations with places for more than 1,500 fattening pigs, 560 sows, 4,500 piglets, 15,000 hens/turkeys, 30,000 pullets/poultry for fattening, 600 cows, 500 calves or 750 fur animals. The simplified permit procedure also applies to manure storage installations above 6,500 m^3. If an environmental permit is required, the permit procedure incorporates other permit and assessment requirements such as EIA, Natura 2000 assessment and building permit.

A building permit is required for the construction, expansion or structural modification of livestock installations in accordance with state building regulations and site-related requirements under construction planning legislation governed by the Federal Building Act (BauGB). If an environmental permit is required the building permit check is incorporated in the environmental permit.

An EIA is mandatory for livestock installations in accordance with the thresholds of Annex I of the EIA Directive. Two sets of thresholds for screening apply: 1) size-based (IED thresholds + 1000 cattle/fur places, or 800 calve places), and 2) size- and site-based thresholds. Regarding the latter the size-thresholds coincide with the simplified permit thresholds. The site-specific screening thresholds are not related to effects on Natura 2000 or other "ammonia or nitrogen sensitive" habitats. An EIA or a screening will be carried out as a procedural component in the permit procedure, either the environmental permit or the building permit.

A Natura 2000 assessment according to Art. 6(3) of the Habitats Directive is also carried out as part of the permit procedure. If a project does not require a permit there is an obligation to notify if substantial environmental impacts on Natura 2000-sites cannot be ruled out with certainty (BNatSchG Art. 34(6)). There are currently no specific assessment (or permit) criteria/thresholds regarding Natura 2000 established as binding legislative requirements. Yet, a proposal for new TA Luft instructions aims to incorporate the cut-off and *de minimis* thresholds established in accordance with court rulings and the so-called Fachkonventionen, see further above 2.4.

In the Netherlands an environmental permit is, firstly, required for livestock installations above the thresholds of the IE Directive, i.e. larger pig and poultry installations. Secondly, farms below the IED thresholds can be subject to a so called "inofficial" screening whether an EIA is needed, due to the case-law of the European Court of Justice and corresponding case law of the Dutch courts. Thirdly, if a farm may have significant effects on a Natura 2000 site a permit on the basis of the Nature Protection Act is needed. An environmental permit may incorporate a Natura 2000 permit in accordance with PAS if such an integrated permit is applied for. It appears that it is not possible to impose more strict BAT requirements than those of the Decree on Low Emission Stables on the basis of the environmental law requirements. The permit on the basis of the Nature Protection Act cannot be granted if the installation does not comply with the requirements of the PAS and therefore may have a significant effect on the site. Establishment or expansion of a livestock installation also needs a building permit.

[32] Umweltverträglichkeitsprüfung Gesetz (UPVG).

According to the Dutch Ammonia and Livestock Installations Act a permit cannot be granted for the establishment of a new livestock installation within 250 m from areas designated as sensitive to acidification. Amendments or enlargements of existing farms are normally permitted if the total emissions of the entire installation do not increase. All Natura 2000 sites which are sensitive to ammonia depositions are also designated as sensitive to acidification. In general the areas are more than 50 ha, unless a smaller area is of exceptional nature value.

Table 4: Permit and environmental assessment requirements – thresholds

	Denmark	Germany	Netherlands
Environmental permit	Regular permit: • IED thresholds, or • >3.500 kg NH_3-N/year Simplified permit: • >100 m^2 production area	Regular permit: • IED thresholds, or • > 6,000 piglets or 1.000 fur animals Simplified permit: • >1,500 fattening pigs, 560 sows, 4,500 piglets, 15.000 hens/turkeys, 30.000 pullets/poultry for fattening, 600 cows, 500 calves or 750 fur animals • Manure storage ≥6,500 m^3	IED permit: • IED thresholds
Building permit	• Livestock buildings	• All livestock buildings (incorporated in environmental permit)	• All livestock buildings
EIA	• No separate thresholds - incorporated in environmental permit procedure (mandatory + screening procedure)	Mandatory EIA: • EIA Dir. Annex I thresholds Screening: • size-based (IED/regular permit thresholds + 1000 cattle/fur places, or 800 calve places • size- and site-based (simplified permit thresholds + site-criteria)	Mandatory EIA: • serving to prepare the IED permit Screening: • threshold + "inofficial" screening of individual situation + site based if effects on Natura 2000-sites cannot be excluded
Natura 2000	• Incorporated in permit procedure	• All (thresholds) • Incorporated in permit procedure	• All, but PAS

The functioning of environmental permits (and building permits) appears to be somewhat different in the three countries. In Denmark the environmental permit procedure is used to ensure compliance with the specific ammonia thresholds as well as BAT and to lay down permit conditions in accordance with that. The specific ammonia thresholds also refer to ammonia sensitive habitats outside Natura 2000 sites. In Germany the environmental permit is also used to control compliance with BAT requirements and other emission reduction requirements established as general standards (TA Luft). If an environmental permit is not required these smaller livestock installations need a building permit and are still subject to environmental operator obligations. The permits incorporate EIA as well as Natura 2000/habitat

assessments in Germany. In Germany TA Luft has so far included consideration of other habitats or plants sensitive to ammonia or nitrogen. In the Netherlands the environmental permit only applies to IED installations, i.e. large pig and poultry installations. A building permit is required for all livestock buildings. Ammonia emissions are in the Netherlands mainly regulated through general standards applicable to all livestock installations, including existing installations. Ammonia emissions in relation to Natura 2000 sites are regulated on the basis of PAS and the 250 m zone established around areas sensitive to acidification, which amongst others cover Natura 2000 sites. According to the Ammonia and Livestock Act it is not possible to take into account the effects of ammonia emissions of livestock installations in the environmental permitting for installations outside the 250 m zone.[33] However, the Nature Protection Act is not influenced by the Ammonia and Livestock Act and applies separately. Therefore, an installation outside the 250 meter zone may not be permitted on the basis of the Nature Protection Act if it may have significant effects on a Natura 2000 site. Whether this is the case is, at the moment, examined on the basis of the PAS.

Thus, what in one country is regulated through permits may in another country be regulated trough general standards – or in a combination of the two. It has not been possible as part of this study to examine e.g. environmental permits in detail. It is likely that there will be some variation as regards the level of information and detail required in permit procedures.

4.2. Emission requirements or standards

Emission requirements or standards, including BAT, may be determined as part of a permit procedure or as general standards. The following focuses on emission limits and technology requirements for livestock installations. Again it must be kept in mind that comparisons should be made with caution as there are variations both as regards the content of e.g. BAT or emission limits as well as in the measurement of e.g. emission limits.

4.2.1 BAT

The legislation often refers to the use of best available technologies (BAT), however there appears to be a need to distinguish between BAT standards in general (as specified in the national legislation) and the so-called BAT-conclusions adopted by the European Commission under the IE Directive.[34] The latter are binding in the permit processes for IED installations, i.e. larger pig and poultry rearing installations. In the following we will distinguish between BAT-IED and other BAT standards.

In Denmark the new 2017 Livestock Installations Act stipulates that a permit shall include BAT requirements if the installation will lead to an ammonia emission above 750 kg NH_3-N per year, cf. Sec. 27(2). The BAT requirements will be established on the basis of BAT standards for different types of livestock productions. These standards will be aligned with the recently adopted EU BAT conclusions under the IE Directive, i.e. BAT-IED as a minimum. The BAT requirements will apply not only in case of a new permit application, but also in case of reconsideration or updating of an existing permit. Livestock installations below the IED or the 750 kg NH_3-N per year threshold are subject to other technology requirements as laid down in e.g. the Executive Order 865/2017 on livestock installations, manure etc. or executive orders for specific types of livestock installations, e.g. fur farms. Existing installations that are not subject to a permit requirement (due

[33] Cf. Art. 3 ff Livestock and Ammonia Act.

[34] Commission Implementing Decision (EU) 2017/302 of 15 February 2017 establishing best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for the intensive rearing of poultry or pigs (notified under document C(2017) 688), C/2017/0688, OJ L 43, 21.2.2017, p. 231–279.

to amendments/enlargements) or updating of a permit are in principle not subject to BAT requirements. They may, however, be subject to an individual order to reduce ammonia emissions in which case reference can also be made to BAT.

In practice, the allowable emission limit is calculated on the basis of the BAT standards and compared to the calculated emission from the installation as laid out in the application. It is possible to take into consideration a number of different measures that will reduce the emission from the installation. If the calculated ammonia emission exceeds the allowable emission limit a permit cannot be granted. Standard ammonia emission levels for slaughter pigs were in 2011 been set between 0.21 and 0.30 kg NH_3-N per produced pig between 32-107 kg.[35] Standard ammonia emission levels for dairy cattle have in 2011 been set between 6.30 and 7.31 kg NH_3-N per cow depending on the number of cows in the stable. The lowest emission levels apply to large farms with more than 750 AU.[36] According to the 2017-rules a maximum emission level shall be calculated per square meter as opposed to animal units.

In Germany BAT is incorporated in the permit procedures, e.g. environmental permits or building permits. TA Luft establishes a number of standards that must be complied with when granting a permit. IED-installations must adhere to BAT-IED and also to the ”Stand der Technik”, which is according to Art. 5 BImSchG the national standard for all installations (including livestock installations), that need an environmental permit. Installations that do not need an environmental permit, are subject to the so-called operator obligation (Art. 22 BImSchG), which is controlled by the environmental authorities. The TA Luft is an administrative regulation that specifies the legal standards set in the BImSchG, especially the ”Stand der Technik”. For installations, that need an environmental permit, the TA Luft is binding for the permit authority. For other installations the TA Luft is a recommending guideline for the environmental authorities controlling the operator obligations. The current TA Luft from 2002 is subject to a review. A draft of a revised TA Luft was proposed in 2016 and expected to be issued in 2017, but it is likely to be issued in 2018. The current TA Luft 2002 operates with a general emission limit for ammonia of 30 mg/m^3 as well as a minimum distance requirement to certain sensitive plants (cultivated) and ecosystems, see further below. The proposed TA Luft 2017 establishes requirements for ventilation and air cleaning systems for IED installations that should reduce ammonia emissions with min 70% – or if disproportionate then min. 40% emission reduction. It has been estimated that if all measures are properly implemented a total nitrogen reduction of approximately 70% can be achieved. According to the BImSchG Art. 17 appropriate orders must be issued for existing IED installations to ensure compliance with the EU BAT Conclusions.

In Schleswig-Holstein a specific Filter Decree for pig housing installations above a certain size was issued in 2014. The Filter Decree applies to pig housing installations above 2,000 fattening places, 750 sows or 6,000 piglet raising places, i.e. pig installations subject to a regular permit. New installations and substantive changes to existing installations above the thresholds must install and operate an exhaust air cleaning system, which eliminate at least 70% of ammonia and particular matter emissions. For pig installations subject to the simplified permit procedure it must be decided in each case whether an air exhaust system is required. Existing pig installations (above the permit thresholds) can be subject to an individual order if the odor or ammonia emissions are exceeded. Furthermore, the Filter Decree requires that new slurry containers in fattening pig installations with more than 1,500 places must be covered by a tent roof. For

[35] Miljøstyrelsen 2011: Vejledende emissionsgrænseværdier opnåelige ved anvendelse af den bedste tilgængelige teknologi (BAT) – Husdyrbrug med konventionel produktion af slagtesvin.
[36] Miljøstyrelsen 2011: Vejledende emissionsgrænseværdier opnåelige ved anvendelse af den bedste tilgængelige teknologi (BAT) – Husdyrbrug med konventionel produktion af malkekvæg.

built containers in excess of 6,500 m^3 the competent authority must impose a tent roof or other technical cover. Other slurry containers and reservoirs in pig farms not subject to an environmental permit (i.e. below 1,500 animal places) must be covered with at least a floating straw layer or other biological cover.

In the Netherlands BAT requirements regarding ammonia are regulated through general rules in the Decree on Low Emission Stables (2015). The decree imposes max. emission limit values for the establishment and expansion of livestock stables – with a few exemptions, e.g. minor stables. The Decree also establishes a transition period until 2020 for existing stables. Meanwhile new stables may need to comply with additional requirements – so-called BAT+ or BAT++ standards - to compensate for emissions from existing stables on the farm. The regional and local authorities cannot impose stricter standards, e.g. due to geographical conditions. The Dutch emission limits has become more strict with effect from 31st December 2017 – for dairy cows from 12.2-8.6 kg NH_3 per animal per place per year and for finishers from 1.6-1.5 kg NH_3. Stricter requirements for IED pig and poultry farms are foreseen to apply from 2020.[37]

4.2.2 Other ammonia requirements or standards (site-dependent)

Apart from the BAT related emission limits other permit criteria or general standards may address ammonia pollution from livestock installations, including slurry containers, depending on the proximity to ammonia or nitrogen sensitive habitats.

In some countries general distance requirements are set in relation to habitats sensitive to ammonia or nitrogen. It may, however, vary to what extent this is expressed as an explicit minimum distance requirement or as a maximum deposition limit or threshold. Furthermore, such "distance requirements" can be part of the permit procedure or be in the form of general rules. It seems that a combination exists in Denmark and the Netherlands, whereas there are no general distance requirements in Germany or in Schleswig-Holstein, but only minimum distances that are determined as part of the permit system.

In Denmark it is not allowed to establish, expand or otherwise amend a livestock installation or manure storage facilities within 10 m from an area with "ammonia sensitive" habitats as identified in Sec. 7 of the Livestock Installations Act, i.e. category 1 and 2 habitats. Small livestock installations that are not subject to a permit requirement as a main rule cannot be established, expanded or amended within 50 m from category 1 and 2 habitats, cf. Executive Order 865/2017 Sec. 8. In addition livestock installations requiring a permit must comply with the specific ammonia thresholds. The specific ammonia thresholds were amended in 2011 making it more clear whether to consider the total deposition from the whole installation or only the additional deposition resulting from an expansion or alteration of the production or installations. The specific ammonia thresholds depend upon the habitat type as well as on the potential cumulative effects considering other nearby livestock installations. As regards habitat types the legislation distinguishes between 3 categories of which only the first is related to Natura 2000 sites.

[37] Luesink & Michels, 2017 p. 26.

Table 5: Definitions of Danish category 1, 2 and 3 habitats

Category 1 habitats	Category 2 habitats	Category 3 habitats
The following habitats if located within a Natura 2000 site: 1. Areas with one of the 43 Annex I habitats considered sensitive to ammonia deposition – no size threshold applied 2. Heaths and dry grasslands protected by the Nature Protection Act Sec. 3.	The following habitats located outside Natura 2000 sites: 1. Raised bogs 2. Lobelia-lakes 3. Heaths above 10 ha 4. Dry grasslands 2.5 ha.	The following habitats located outside Natura 2000 sites: 1. Other areas with heath, bog/moor or dry grassland protected by the Nature Protection Act Sec. 3. 2. Old grown forests fulfilling the criteria for being sensitive for ammonia deposition

As regards category 1 and 2 habitat types the total deposition from the livestock installation is decisive, whereas only the additional deposition resulting from the new project (expanded or altered production) is taken into account as regards category 3 habitats. When the total deposition is taken into account the result might be that a permit for an expansion of a livestock installation cannot be granted even though the result due to technological measures could be a lower ammonia emission than the one resulting from the existing installation.

In addition to the specific ammonia criteria regarding ammonia deposition in the Livestock Installations Act, the potential effects on other protected nature types should also be taken into account. This includes e.g. lakes or small ponds above 100 m^2 that are protected under the Nature Protection Act.

The German TA Luft 2002 operates with a calculated minimum distance requirement to certain nitrogen-sensitive plants (cultivated) and ecosystems. If the minimum distance requirement is exceeded an individual or special-case examination must be carried out – unless an additional concentration of 3 µg NH_3/m^3 in the air is not exceeded. According to TA Luft (4.8) an installation can be approved if no harmful environmental impact can be caused. There are no indications of a harmful environmental impact if the total ammonia exposure in the reception area does not exceed 10 µg/m^3. The proposed TA Luft 2017 incorporates the cut-off and *de minimis* thresholds regarding Natura 2000 sites, and establishes cut-off and *de minimis* threshold for other sensitive plants and ecosystems (max. 2 kg N/ha/year), see above 2.4.

In the Netherlands it appears that site-dependent standards regarding ammonia emissions from livestock installations are related to ammonia or nitrogen sensitive Natura 2000 sites as well as other areas which are designated as being sensitive to acidification. According to the Livestock and Ammonia Act the provinces designate nature areas vulnerable to acidification. All Natura 2000 sites which are sensitive to nitrogen (and subject to PAS) are also designated as vulnerable to acidification, but also other areas are designated. An environmental permit for a new livestock installation in or within 250 m from an area vulnerable to acidification must be rejected. For changes or enlargement of existing installations a permit can be granted if the total emission from the installation do not increase.

Table 6: Emission standards or requirements

	Denmark	Germany, Slesvig-Holstein	Netherlands
BAT	BAT-IED part of the permit procedure for installations with ammonia emissions above 750 kg NH_3-N/year: • Emission limits • + existing buildings that are significantly renovated • Other existing buildings – individual assessment (proportionality)	Part of permit procedure for IED-installations under BImSchG and supplemented by "Stand der Technik" obligations for all installations requiring an environmental permit: • Emission limit (exhaust air): max. 30 mg/m^3 • For existing stables the authorities can enact retroactive orders for implementing BAT-IED Ventilation and air cleaning (TA Luft 2017 proposal): • IED installations (min 70% emission reduction rates for ammonia etc. – if disproportionate then min. 40% emission reduction) • SH Filter Decree, 2014: Pig farms above 2,000 fattening pigs, 750 sows, 6,000 piglets – new and substantive changes.	Decree on Low Emission Stables (general standards for all livestock installations): • Max. emission limit values • Transition period until 2020 for existing stables • BAT+ or BAT++ for new stables when compensating for emissions from existing stables
Other site-dependent ammonia emission criteria or standards	Livestock Installations Act (permit criteria): • Category 1 (N2000), see above table. • Category 2: max. 1 kg N/ha/year total load • Category 3: >1 kg N/ha/year additional load Nature Protection Act: Individual assessment re. certain nature types	TA Luft (2002) – applicable to livestock installations subject to an environmental permit under BImSchG and recommendation guidance for operator obligations of non-environmental permit installations: • Min. calculated distance requirements to sensitive plants (eg. horticulture) and ecosystems (based on ammonia emission factors) • Or special-case examination, unless below 3 µg NH_3/m^3 Natura 2000 sites, see table 2. Other sensitive plants or ecosystems due to the proposed TA Luft: • Immission cut-off threshold: 2 kg N/ha/a additional load, or de minimis treshold: <10 % of CL	Ammonia and Livestock Installations Act: • Min distance 250 m from areas sensitive to acidification – no new establishment, only changes/enlargement if no increase in ammonia emissions, i.e. no additional load • Natura 2000 and PAS, see table 2.

Table 7: Slurry containers – cover requirements

	Denmark	Germany, Schleswig-Holstein	Netherlands
General standards	Solid or "dense" cover (incl. crust)	Tent roof (SH Filter Decree): • Pig farms above 1,500 fattening pigs – new containers Tent roof or other technical cover (SH Filter Decree): • Containers above 6,500 m^3. Floating straw layer: all other pig farm containers (SH Filter Decree)	Solid cover (all manure storage).
Site-specific standards	Solid cover, if less than 300 m from ammonia sensitive habitats (cat. 1 + 2)		

4.3. Ammonia regulation of other agricultural activities (cultivation practices, spreading of manure/organic fertilisers etc.)

The spreading of manure and other (organic) fertilisers is in all three countries regulated by general standards setting specific requirements regarding incorporation or injection, in particular for grassland or untilled land. Incorporation refers to ploughing or other cultivation techniques to mix the solid manure with the soil. Injection may use different techniques. Furthermore, maximum levels of manure applications are set in accordance with the requirements of the Nitrates Directive.[38]

In Denmark, the option to lay down individual permit conditions regarding spreading of manure close to ammonia sensitive habitats has by 1 August 2017 been replaced by a general 20 m buffer zone around category 1 habitats (Natura 2000) as well as category 2 raised bogs and lobelia lakes. Within this buffer zone specific requirements on injection or incorporation of fertilizer applies.

In Germany, it is mandatory to incorporate organic fertilisers on untilled farmland within 4 hours. A similar requirement as regards solid manure applies in the Netherlands for arable land. From 2020 specific requirements will apply as regards injection of liquid manure on arable land, and from 2025 on grassland.

In the Netherlands it is mandatory since 1991 to incorporate manure either directly or shortly after application. More specific rules on application methods exist for application of slurry on grassland and on arable land respectively, and for solid manure on arable land.

[38] Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources, OJ L 375, 31.12.1991, p. 1–8.

Table 8: Manure spreading techniques

	Denmark	Germany, Schleswig-Holstein	Netherlands
Incorporation	• Incorporation of solid manure on untilled farmland within 4 hours	• Incorporation of organic fertilisers on untilled farmland within 4 hours	• Incorporation of manure directly or shortly thereafter on arable land (two tracks) • Emission techniques required for different kinds of areas
Injection and other application techniques	Liquid manure (slurry) • Hoses or injection • Injection on grasslands, untilled land etc	Liquid organic or liquid organic-mineral fertiliser must after 2020 be deposed in stripes or directly injected on arable land and after 2025 on grassland urea-fertiliser must after 2020 have urea-inhibitor or be incorporated within 4 hours	Liquid manure (slurry) • Specified techniques for grassland and arable land
Site-specific standards (re. ammonia)	20 m buffer zones cat. 1 (+ cat. 2 lobelia lakes and raised bogs): • Injection of slurry • Incorporation within 4 hours		

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