Miljøministeriet
Miljøstyrelsen

Udenlandske erfaringer med emissionsbaseret regulering af husdyrbrug

Slutrapport

Titel:

Udenlandske erfaringer med emissionsbaseret regulering af husdyrbrug

Redaktion:

Henning Lyngsø Foged

Udgiver:

Miljøstyrelsen
Strandgade 29
1401 København K
www.mst.dk

År:

2014

ISBN nr.

978-87-93178-63-2

Indhold

Forord

Husdyrreguleringsudvalget har anbefalet, at anlæg og arealer skilles ad i husdyrreguleringen, idet anlægsdelen fremover skal reguleres efter en emissionsorienteret ordning, hvor miljøgodkendelsen bliver givet i forhold til de faktiske emissioner til omgivelserne. Med den nuværende ordning reguleres husdyrbrugene efter antallet af dyr i staldene. Natur- og Landbrugskommissionen har i sin rapport fra april 2013 støttet op om dette med følgende anbefalinger:

- 14: Ny regulering af husdyrproduktionen. Bl.a. "Der bør gennemføres en ny, emissionsbaseret regulering, hvor tilladelse eller godkendelse af anlæg til husdyrbrug ikke længere begrænser antallet af producerede dyr, men i stedet udformes som en udledningstilladelse (emissionsgrænser) for de væsentligste natur- og miljøpåvirkninger. Samtidigt bør der ske en adskillelse af reguleringen, så gødningsanvendelse mv. på arealerne, i modsætning til i dag, reguleres adskilt fra reguleringen af selve produktionsanlægget."
- 15: Ny teknologi til miljøregulering.
- 16: Nyt fokus på luftbåren kvælstof.

I den sammenhæng er nærværende rapport udarbejdet for Miljøstyrelsen som en forundersøgelse af, om der i udvalgte referencelande er implementeret miljøregulering af husdyrbrug, der er emissionsorienteret i forhold til anlægsdelen. Redegørelsen i rapporten skal indgå i Miljøstyrelsens fremadrettede arbejde med regulering af husdyrbrug jf. Natur- og Landbrugskommissionen anbefalinger.

Tjele, December 2013

Henning Lyngsø Foged
Agro Business Park

Konklusion og sammenfatning

Denne rapport er udarbejdet på basis af anbefalinger fra Husdyrreguleringsudvalget og Natur og Landbrugskommissionen om at indføre emissionsbaseret regulering af husdyrbrug.

Rapporten indeholder en redegørelse for erfaringer med emissionsbaseret regulering af husdyrbrug i udvalgte referencelande. Det er hensigten med rapporten, at de udenlandske erfaringer skal indgå i Miljøstyrelsens fremadrettede arbejde med regulering af husdyrbrug jf. Husdyrreguleringsudvalgets og Natur- og Landbrugskommissionens anbefalinger.

En indledende screening, der omfattede samtlige EU lande samt udvalgte oversøiske lande (USA, Japan, Rusland og Canada), gav 23 svar, idet specielt en række af de nye EU lande i Østeuropa, så som Rumænien og Bulgarien, ikke reagerede på den spørgeundersøgelse, som var et væsentligt grundlag for screeningen. Det antages at de lande, som ikke har svaret, ikke har erfaring med emissionsbaseret regulering. 11 af de responderende lande, herunder 3 oversøiske lande, har en vis form for emissionsbaseret regulering.

Holland, Belgien (den flamske del) samt Tyskland blev på basis af en vurdering af disse landes svar på spørgeundersøgelsen, sammenholdt med landenes forekomst i litteratur om emissionsbaseret regulering af husdyrbrug, samt en vurdering af udvalgte indikatorer for potentielle udfordringer med hensyn til emissioner, udvalgt som primære referencelande. Der er desuden indsamlet yderligere information fra Estland og Finland, som også gav interessante tilbagemeldinger i screeningsfasen.

Der er gennemført en studietur til hvert af de primære referencelande med henblik på vidensindsamling, specielt med hensyn til landenes lovgivning vedrørende emissioner fra husdyrhold, samt tilknyttede emissionslofter og normsæt, samt metoder for kontrol. Studieturene er gennemført i 2013 i henholdsvis uge 34 (Flandern) og 36 (Tyskland og Holland). Yderligere information fra Estland og Finland er indsamlet via møder i Helsingfors i forbindelse med konferencen "A greener agriculture for a bluer Baltic Sea"[1] i slutningen af august 2013. Det har for de nævnte lande været ønsket at søge informationer via møder med primært de relevante miljømyndigheder, som står med det overordnede ansvar for gennemførelse af lovgivningen, sekundært med forskningsinstitutioner, som støtter myndighederne med normsæt og tekniske anbefalinger.

Referencelandene Holland, Belgien og Tyskland, som allerede i årevis har fokuseret på emissioner i deres regulering af husdyrbrug, har en lovgivning og administration, der på væsentlige punkter er sammenlignelig med den vi har i Danmark. De har ikke indført kvoter for emissionerne, og derved heller ikke kvoter som husdyrbrugeren frit kan forvalte, fx ved at fordoble produktionen samtidig med en halvering af emissionerne per dyr. Dette skyldes formentlig, at det for nuværende er teknisk og økonomisk urealistisk at monitere emissioner fra husdyr, men også at miljøgodkendelser jf. Direktivet for Industrielle Emissioner (2010/75/EU), fx også drejer sig om støj, energiforbrug og affaldshåndtering.

Mens ovenstående i sig selv er en væsentlig information, vi kan drage nytte af, er der i referencelandenes regulering af emissioner en række elementer, vi kan lade os inspirere af.

[1] http://www.gabbs.eu

Referencelandenes regulering af emissioner baserer sig på antal stipladser i staldene, og de har fastsat emissionsfaktorer og grænseværdier for de typer af emissioner, som ønskes reguleret, og spredningsmodeller anvendes til vurdering af afstandskrav. Den følgende oversigt viser, hvordan referencelandene håndterer væsentlige faktorer vedrørende regulering af emissioner:

	Holland	Belgien (Flandern)	Tyskland	Estland	Finland
Parametre, der kontrolleres på husdyrbrug med miljøgodkendelse	• Antal husdyr og type husdyr • Staldtype	• Antal husdyr og type husdyr • Staldtype	• Antal husdyr og type husdyr • Staldtype	• Antal husdyr og type husdyr	-
Husdyrenhed, som benyttes i miljøgodkendelser	• Staldpladser og type husdyr	• Staldpladser og type husdyr	• Staldpladser og type husdyr	• Antal husdyr og type	• Miljø belastnings indeks[2]
Typer af emissioner, som reguleres, og som der er opstillet koefficienter for	• Ammoniak • Lugt • PM10	• Ammoniak • Lugt • PM10 • PM2,5	• Ammoniak • Lugt • PM10 • Total støv • [3]Bioaerosoler	• Ammoniak • Metan • Lattergas	• Ammoniak[4]
Anvendte spredningsmodeller	• V.STACKS	• IFDM	• TA Luft + GIRL	-	-

I Danmark har vi allerede velfungerede rammer i form af:

- Normtal for husdyrgødning, med specifikation af dyreart, type, foderintensitet, staldtype og gødningstype (Damgaard, 2012);
- Et referencedokument for bedst tilgængelige teknologier (BREF), der beskriver de relevante, generiske teknologier (under revision); og
- Et system til officiel validering af kommercielt tilbudte teknologiers miljøeffekt, fx baseret på VERA verifikationer (idet systemet til verifikation af kommercielt tilbudte miljøteknologier dog er i stadig udvikling, og bør ende op i et verifikationssystem, som anerkendes i alle EU lande).

Referencelandene gav generelt udtryk for, at de anser det danske system for velfungerede og fleksibelt, da det tillader husdyrbrugere frit at konfigurere stalde med hen syn til miljøteknologier vedrørende både fodring, luftrensning, og gulvtype, m.v.

Den nye miljø-relaterede husdyrenhed, som Finske forskere er ved at udvikle, miljøbelastningsindekset, forekommer interessant, da det evt. vil være gavnligt med en pædagogisk enhed, bl.a. til fastsættelse af grænsen for størrelsen af forskellige typer husdyrbrug i relation til krav om miljøgodkendelse. Alternativt kan man anvende antal stipladser ligesom referencelandene. Referencelandene har opstillet koefficienter samt grænseværdier for de emissionstyper, de regulerer. Alle referencelande regulerer for støv.

I relation til afstandskrav foretager referencelandene individuelle beregninger med spredningsmodeller, der kan håndtere både direkte og akkumulerede effekter for de typer af emissioner og immissioner vi ønsker at regulere.

[2] Ikke taget i anvendelse.
[3] Vurderes, men der er ikke fastsat koefficienter.
[4] Emissionskoefficienter findes, men regulering er endnu ikke iværksat.

De mere detaljerede informationer, som er indsamlet fremgår at Bilag 2-6 nedenfor, der også omfatter kæder til de relevante, officielle lovtekster, vejledninger og normsæt, samt oversigt over de personer, som via møder m.v. har assisteret med at bibringe informationerne. Kapitel 3 indeholder en sammenskrivning med fokus på elementer, som må anses for væsentlige i relation til muligheden for at indføre en emissionsbaseret regulering af husdyrbrug.

Summary and Conclusion

This report has been prepared for the Danish Environmental Protection Agency on the background of recommendations from ”Husdyrreguleringsudvalget” (a temporary committee established to suggest alternatives to the actual regulation of animal husbandry) and “Natur- og Landbrugskomissionen” (transl.: The Nature and Agricultural Commission) to introduce emission-based regulation of livestock farms.

The report contains an account of experiences with emission-based regulation of livestock in selected reference countries. It is the intention that the foreign experience should be included in the ongoing work of the Danish Environmental Protection Agency to introduce emission-based regulation of livestock farms in accordance with the recommendations from the Animal Control Committee and the Nature and Agricultural Commission.

An initial screening that included all EU countries and selected overseas countries (USA, Japan, Russia and Canada), gave 23 responses; especially some of the new EU countries in Eastern Europe, such as Romania and Bulgaria, did not respond to the survey which was an essential basis for screening. It is assumed that the countries that did not answer, does not have experience with emission-based regulation. 11 of the responding countries, including 3 overseas countries have some form of emission-based regulation.

Netherlands, Belgium (the Flemish part), and Germany was based on an assessment of their response to the survey, compared with occurrence in literature on emission-based regulation of livestock, as well as an assessment of selected indicators of potential challenges with respect to emissions, selected as primary reference countries. There are also collected additional information from Estonia and Finland, which also gave interesting feedback in the screening phase.

A fact-finding mission was organized to each of the primary reference countries for the purpose of collecting more detailed information, especially with regard to legislation on emissions from livestock and associated emission limits and norms and methods of control. The fact-finding missions were conducted in Week 34 (Flanders) and 36 (Germany and the Netherlands) of 2013. Further information from Estonia and Finland was collected through meetings in Helsinki in connection with the conference "A greener agriculture for a bluer Baltic Sea" at the end of August 2013. It was for the mentioned countries especially been the aim to seek information through meetings, primarily with the relevant environmental authorities responsible for the overall implementation of the legislation, secondarily with research institutions supporting the authorities with standards and technical recommendations.

The reference countries, Holland, Belgium and Germany, who already for years have focused on emissions in their regulation of livestock farms, they regulate emissions from livestock farms in ways that are comparable to the Danish regulation. They have not introduced quotas for emissions, and thus do not have quotas that livestock farmers freely can manage, for example by doubling their production while halving emissions per animal. This is probably because it currently is technically and economically unrealistic to monitor emissions from livestock, but also due to the fact that environmental approvals pursuant to the Directive on Industrial Emissions (2010/75/EU), for example also deals with noise, energy consumption and waste management.

While the above on its own is a significant information, we can benefit from, the reference countries' ways to regulate emissions includes a number of elements, we can be inspired by.

Reference countries' regulation of emissions is based on the number of livestock places in barns, and they have set emission factors and limit values for the types of emissions that must be regulated, and dispersion models are used to estimate separation distances. The following table shows how the reference countries handle important factors about regulation of emissions:

	Netherlands	Belgium (Flanders)	Germany	Estonia	Finland
Parameters that are controlled on livestock farms with environmental permits	• Number of livestock places and type of livestock • Housing system	• Number of livestock places and type of livestock • Housing system	• Number of livestock places and type of livestock • Housing system	• Number of livestock places and type of livestock	-
Livestock unit used in environmental permits	Number of livestock places and type of livestock	• Number of livestock places and type of livestock	• Number of livestock places and type of livestock	• Number of livestock places and type of livestock	• Environmerntal Impact Index (EII)[5]
Type of emissions that are regulated and for which emission coefficients exists	• Ammonia • Smell • PM10	• Ammonia • Smell • PM10 • PM2,5	• Ammonia • Smell • PM10 • Total dust • Bioaerosols[6]	• Ammonia • Methane • Laughter gas	• Ammonia[7]
Used dispersion models	• V.STACKS	• IFDM	• TA Luft + GIRL	-	-

Denmark has a well-functioning framework in the form of:

- The normative values for manure, specified on species, animal type, feed intensity, type of housing and manure type (Damgaard, 2012);
- A reference document on best available techniques (BREF) describing the relevant generic technologies (currently being revised); and
- A system for the official verification of commercially offered technologies' environmental impact, e.g. based on VERA verifications (the system for verification of commercially offered environmental technologies, however, is constantly evolving, and should end up in a verification system, which is recognized in all EU member states).

Reference countries generally indicated that they consider the Danish system for well functioning and flexible, as it allows livestock farmers freely to configure their stables with environmental technologies, both concerning feeding, air cleaning, and floor type, etc.

[5] Ikke taget i anvendelse.
[6] Considered, but no concrete emission factors or emission limits determined.
[7] Emissionskoefficienter findes, men regulering er endnu ikke iværksat.

The new environment-related livestock unit that Finnish researchers are developing, appears to be interesting, because it possibly would be beneficial to have a pedagogical unit for setting thresholds for different types of livestock in relation to the requirements for an environmental permit.

The reference countries have establishes coefficients and limit values for the emission types they regulate. All the reference countries also regulates dust.

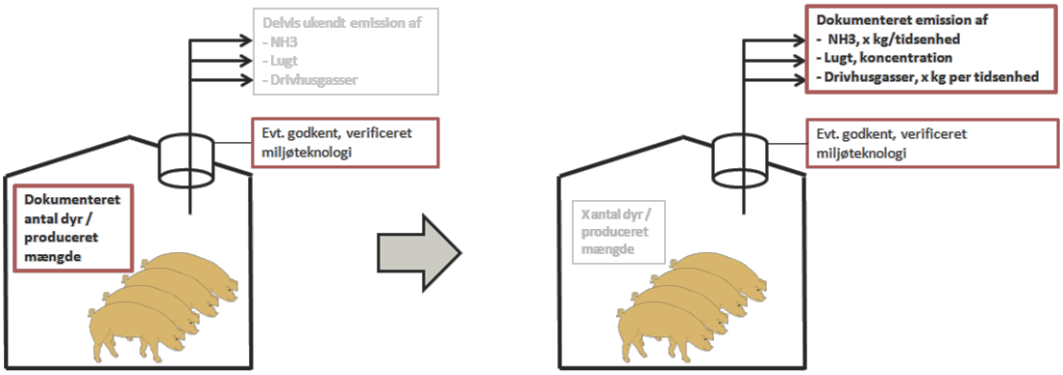
Requirements to distances from the stables to for example vulnerable nature or neighbours, are individually calculated by use of dispersion models that can handle both direct and cumulative effects of the types of emissions and immissions.

More detailed information appears from Annex 2-6 below, which also includes links to the relevant official legal texts, guidelines and norms, and a list of those who through meetings, etc. have assisted in identifying relevant information. Chapter 3 contains a compilation focusing on the elements that is considered significant in relation to the possibility of introducing emissions-based regulation of livestock.

1. Baggrund

Både Husdyrreguleringsudvalgets samt Natur- og Landbrugskommissionen har peget på at regulering af husdyrbrug fremover bør adskilles fra arealerne, og ske på basis af emissionsrettigheder, i overensstemmelse med de overordnede metoder man anvender for at regulere emissioner fra anden industri.

Figur 1 skitserer dette paradigmeskift i reguleringen af husdyrbrug, der i dag reguleres via metoder, der i høj grad bygger på produktionsomfanget.



Figur 1: Reguleringen af husdyrbrug sker i dag via metoder, der i høj grad bygger på produktionsomfanget, men bør jf. Husdyrreguleringsudvalget og Naur og Landbrugskommissionen ændres til at ske på basis af emissionsrettigheder.

Nærværende rapport redegør i den forbindelse for, hvordan emissioner indgår i reguleringen af husdyrbrug i udvalgte husdyrintensive lande i fortrinsvis Nordeuropa, idet disse landes lovgivning og erfaringer på området kan give inspiration til udarbejdelse af en model for den fremtidige regulering i Danmark. Der redegøres specielt for

- specifikke bestemmelser i udvalgte referencelandes lovgivning, herunder fastsættelse af loft for luftbårne emissioner af ammoniak og lugt, m.v. fra dyr på stald, staldanlæg og gyllelagre,
- belysning af emissionernes påvirkning af fodring, staldsystem og anvendt, certificeret miljøteknologi, samt
- metoder for direkte eller indirekte bestemmelser til vurdering af overholdelse af emissionsloft, dvs. anvendte målinger eller beregninger.

Den helt overvejende vægtning af de ovenstående tre emner er lagt på beskrivelsen af referencelandenes specifikke lovbestemmelser.

2. Metode

2.1 Rapportens formål

Det specifikke formål med nærværende rapport er at redegøre for følgende:

- En overordnet beskrivelse af reguleringen i det pågældende land eller region (kort beskrivelse af reglerne på området).
- En overordnet beskrivelse af administrative erfaringer hos den udøvende myndighed (svært/let at administrere, udfordringer, opmærksomhedspunkter mv.).
- En beskrivelse af hvorledes emissionerne opgøres (beregning, måling osv.).
- En beskrivelse af hvorledes krav til teknologi indgår i modellen.
- En beskrivelse af myndighedens kontrol og tilsyn med emissioner.
- En beskrivelse af husdyrbrugets evt. forpligtigelser til indberetning, emissionsopgørelse osv.
- En beskrivelse af ansøgningssystem og procedurer.

Konklusioner på basis af ovenstående beskriver identificerede fordele og ulemper ved den konkrete reguleringsmodel, herunder relevante erfaringer, så som husdyrbrugers handlefrihed, forenklet sagsbehandling eller øget bureaukrati.

2.2 Indledende screening identificerede relevante referencelande

Identifikation af relevante referencelande er sket ved hjælp af en screeningsproces, gennemført i løbet af sommeren 2013, der som væsentlige komponenter baserede sig på en spørgeundersøgelsen, en vurdering af landenes umiddelbare forekomst i litteratur om emissionsbaseret regulering af husdyrbrug, samt en vurdering af udvalgte indikatorer for potentielle udfordringer med hensyn til emissioner.

Screeningen omfattede samtlige EU lande samt udvalgte oversøiske lande (USA, Japan, Rusland og Canada).

Spørgeundersøgelsen gav 23 svar, idet specielt en række af de nye EU lande i Østeuropa, så som Rumænien og Bulgarien, ikke reagerede på den spørgeundersøgelse, som var det væsentligste grundlag for screeningen. Det antages at de lande, som ikke har svaret, ikke har erfaring med emissionsbaseret regulering. 11 af de responderende lande, herunder 3 oversøiske lande, har en vis form for emissionsbaseret regulering.

Screeningen gav basis for at konkludere at

- der ikke i noget andet land forefindes en emissionsbaseret regulering af husdyrbrugene, svarende til den måde, der anbefales i Danmark;
- indirekte former for emissionsbaseret regulering indgår i større eller mindre grad i 11 af de 23 screenede landes regulering af husdyrbrug, heraf i 3 oversøiske lande;
- de lande, som tilsyneladende har mest erfaring med emissionsbaserede reguleringsformer er Holland, Tyskland og Belgien (den flamske del), hvorfor der i det følgende specielt redegøres for situationen i disse lande, som i det følgende benævnes referencelande eller primære referencelande, hvor de ikke er benævnt direkte;

- Estland og Finland gav også interessante tilbagemeldinger i screeningsfasen, og derfor er der også indsamlet yderligere information fra disse lande.

Den komplette sammenfatning fra screeningsprocessen findes i Bilag 1.

2.3 Studieture til indsamling af mere detaljeret information

Der er gennemført en studietur til hvert af disse lande med henblik på vidensindsamling, specielt med hensyn til deres lovgivning vedrørende emissioner fra husdyrhold, samt tilknyttede emissionslofter og normsæt, samt metoder for kontrol.

Studieturene gennemførtes i henholdsvis uge 34 (Flandern) og 36 (Tyskland og Holland).

Informationerne indsamlet for Belgien er nærmere betegnet vedrørende Flandern, og altså hverken dækkende for Wallonien, eller for Belgien som helhed, idet forholdene i Wallonien ikke anses for at være af interesse i denne forbindelse.

Yderligere information fra Estland og Finland blev indsamlet via møder i Helsingfors i forbindelse med konferencen "A greener agriculture for a bluer Baltic Sea"[8] i slutningen af august 2013.

Der har også været forsøgt indhentet yderligere informationer fra Spanien, Polen og Tjekkiet, hvilket dog ikke har ledt til yderligere afklaring af situationerne i disse lande.

Det har for de nævnte lande været et ønske at søge informationer via møder med primært de relevante miljømyndigheder, som står med det overordnede ansvar for gennemførelse af lovgivningen, sekundært med forskningsinstitutioner, som støtter myndighederne med normsæt og tekniske anbefalinger.

De væsentligste informationer, som er indsamlet fremgår at Bilag 2-6 nedenfor, der også omfatter kæder til de relevante, officielle lovtekster, vejledninger og normsæt, samt oversigt over de personer, som via møder m.v. har assisteret med at bibringe informationerne.

[8] http://www.gabbs.eu

3. Håndtering af emissioner i referencelandene

Emissioner har stor betydning i de primære referencelande, og formentlig også større betydning end i Danmark. Eksempelvis er der i Holland, som er af samme størrelse som Danmark, tre gange så mange mennesker og dobbelt så mange husdyr som i Danmark. Det siger sig selv at der i et sådant land er tilsvarende større emission af støvpartikler fra transport m.v., og at husdyrproduktion i samkvem med naboer og det øvrige samfund er en udfordring i relation til fx lugtgener.

Det skal i denne forbindelse også nævnes, at man i andre lande, hvor der ikke er nogen binding mellem areal og husdyr, ser en større variation i husdyrtæthenden end i Danmark, hvor kravet om at eje det såkaldte harmoniareal først faldt bort i 2010. I Veluwe regionen i Holland er husdyrintensiteten 9 gange så høj som i Danmark, og i mange regioner af Holland og Belgien er husdyrtætheden 4-6 gange så høj som i Danmark (Eurostat - http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do). I Holland startede man for ca. 15 år siden med at regulere emissioner fra husdyrbrug. Holland har siden givet inspiration til andre landes inkorporering af emissioner i regulering af husdyrproduktionen.

Det blev allerede afklaret i den indledende søgning efter referencelande (Bilag 1), "at der ikke findes emissionsbaseret regulering i noget andet land" i en form som anbefalet i Danmark.

Alligevel kan vi finde nyttig inspiration i erfaringer fra referencelandene, og i det følgende gennemgås de væsentligste elementer, som vurderes at være af betydning, idet mere uddybende detaljer findes i Bilag 2-6 for henholdsvis Belgien (Flandern), Estland, Finland, Tyskland og Holland.

3.1 Overordnet beskrivelse af emissionsbaseret regulering i referencelande

Den emissionsbaserede regulering i referencelandende består af følgende væsentlige elementer:

1. Lovmæssige rammer, der fastsætter, hvilke kategorier af husdyrbrug, der skal have en miljøgodkendelse, samt hvilken procedure der skal gælde for de forskellige kategorier.
2. Beslutning om en miljørelateret husdyrenhed
3. Beslutning om type emissioner, der reguleres
4. Officielle emissionskoefficienter samt tilhørende grænseværdier
5. Spredningsmodeller

Det skal bemærkes at der også i den eksisterende danske regulering er elementer, der på samme vis som i referencelandende, har elementer af emissionsorienteret regulering.

3.1.1 Lovgivningsmæssige rammer

Der er stor forskel på hvordan de tre referencelande har struktureret deres lovgivning, men der er også en række lighedspunkter.

- Tyskland forekommer at være det referenceland, som har den bedst strukturerede og overskuelige lovgivning. Den centrale lov er 'Bundes Immisions Scutzt Gesetz' (BImSchG - http://www.gesetze-im-internet.de/bundesrecht/bimschg/gesamt.pdf), der bl.a. fastslår i § 4-21 at husdyrbrug over en vis størrelse kræver miljøgodkendelse. Under BImSchG findes en række tilhørende forordninger, hvoraf nr. 4 vedrører husdyrbrug (BImSchV - V = Verordnung, http://www.bmu.de/service/publikationen/downloads/details/artikel/4-bimschv-vierte-verordnung-zur-durchfuehrung-des-bundes-immissionsschutzgesetzes/?tx_ttnews%5BbackPid%5D=1892&cHash=fd742f526beada32176bc46019189e1b), og indeholder de detaljerede bestemmelser, fx at husdyrbrug skal have en miljøgodkendelse, hvis de har over 560 staldpladser til søer, 600 pladser til kvæg, eller 30.000 pladser til slagtekyllinger. En VVM lov (UVPG - http://www.gesetze-im-internet.de/uvpg/anlage_1_62.html) fastsætter i Annex 1 at VVM skal gennemføres såfremt husdyrbruget har flere dyr end grænsen fastsat i VVM Direktivet (2011/92/EU), fx mere end 3.000 pladser til slagtesvin over 30 kg. Et antal vejledninger beskriver procedure og metoder til gennemførelse af lovgivningen, fx TA Luft (Technische Anleitung zur Reinhaltung der Luft – http://www.umweltbundesamt.de/luft/messeinrichtungen/TALuft_020724.pdf); miljøgodkendelser gives jf BImScG efter et "forsigtighedsprincip" samt et "beskyttelsesprincip", hvilket i praksis betyder at vejledningen "TA Luft" skal respekteres. Den såkaldte VDI Vejledning (http://www.vdi.de/uploads/tx_vdirili/pdf/1802148.pdf) indeholder bl.a. referencer til definerede og beskrevne staldtyper.
- I Belgien (Flandern) er al miljølovgivning samlet i VLAREM I, der indeholder lovgivning, samt VLAREM II, der beskriver procedurer (http://navigator.emis.vito.be/milnav-consult/consultatie;jsessionid=500161E9A3E4EE67E0725C6DA3EB9348?language=en). VLAREM I fastsætter i §5.9 bestemmelser om fx afstandskrav (benyttes dog ikke – i stedet anvendes spredningsmodeller) og fastlægger at antal dyr man får godkendelse til at holde har sammenhæng til det definerede staldsystem man anvender. Appendiks 1.9 definerer at husdyrbrug er opdelt i kategori 1, 2 eller 3, alt efter deres størrelse, fx er husdyrbruget kategori 1, hvis der er mere end 1.000 staldpladser til svin, og kategori 2, hvis der er mellem 20 og 1,000 pladser. Kategori 1 er de største husdyrbrug og de største af dem er IPPC farme, hvoraf de fleste i forbindelse med en miljøgodkendelse gennemgår en VVM. Kategori 3 er de mindste, og de behøver kun at meddele myndighederne, at de holder husdyr. VLAREM I, 5.9.2.1 fastsætter at alle nye stalde, som opføres, eller som gennemgår en væsentlig renovering, skal være en såkaldt lav-emissions stald, beskrevet i standard byggebeskrivelser i dette dokument - http://www.vlm.be/SiteCollectionDocuments/Mestbank/Emissiearme%20stallen/mb_stallen_.pdf – til sikring af at alle nye stalde har mindst 70 % lavere ammoniak emission end traditionelle stalde.
- Holland har en overordnet Miljølov (http://www.eui.eu/Projects/InternationalArtHeritageLaw/Documents/NationalLegislation/Netherlands/environmentalmanagement2004.pdf) der fastsætter at husdyrbrug over IPPC-farm størrelse (fx mere end 750 staldpladser til søer, jf. IED Direktivet) skal have en miljøgodkendelse, mens husdyrbrug under denne størrelse alene skal meddele myndighederne, hvor mange dyr de har og hvilken type staldsystem de holdes i. Imidlertid gælder de såkaldte bindende regler for alle husdyrbrug, herunder regler om at begrænse emissioner af ammoniak, lugt og støv. Selvom de mindre brug ikke har gennemgået en miljøgodkendelse, bliver de kontrolleret på lige fod med dem, som har en miljøgodkendelse, dog kun hvert tredje år, mod hvert år for de miljøgodkendte. En række andre love og vejledninger indeholder bestemmelser om emissionsfaktorer (se nedenfor), og der findes en række definerede og beskrevne staldtyper, som fx http://www.infomil.nl/publish/pages/72318/bwl_2008_01_v1.pdf, der via biologisk luftrensning sikrer 70 % lavere ammoniakemission.

Kendetegnende for de lovgivningsmæssige rammer i referencelandene vedrørende emissioner fra husdyrbrug er at der er en overordnet og generel miljølovgivning, som en række sekundær og tertiær lovgivning refererer til. Det specielle i forhold til den danske lovgivning er, at man har

defineret og beskrevet en række staldtyper, som husdyrbrugere kan vælge mellem i forbindelse med udvidelser og sanering af staldkomplekset – en form for standard byggeblade, som er udarbejdet af forskningsinstitutioner.

3.1.2 Beslutning om en miljørelateret husdyrenhed

Referencelandene henholder sig til de besætningsstørrelser, der angives i Direktivet om Industrielle Emissioner (2010/75/EU), og har i nogle tilfælde tabeller, der angiver størrelsen af husdyrbruget for forskellige husdyrkategorier, hvilket afgør den type miljøgodkendelse, der kræves, og hvilken proces en ansøgning skal behandles efter. Antal stipladser er i sagens natur ikke er baseret på nogen bestemt definition med hensyn til den emission, som stipladsen giver. Derfor kan antal stidpladser ikke umiddelbart anvendes som konverteringsfaktor fra en husdyrtype til en anden.

I Finland arbejder Miljøministeriet på at udvikle en ny miljørelateret enhed, et miljøbelastningsindeks. Hver dyrekategori gives et indeks (en koefficient), beregnet ud fra en sammenvægtning af dets miljøbelastning, både med hensyn til kvælstof og fosfor, samt tab til luften og vandmiljøet. Referencen for indekset er 1 slagtesvin, som har et indeks på 1,0.

$$Emission * karakteristik\ faktor = miljøbelastningsindeks$$

Det kunne i det videre arbejde med indførelse af emissionsbaseret regulering af husdyrbrug overvejes at tage et miljøbelastningsindeks i anvendelse som en pædagogisk og fagligt begrundet konverteringsfaktor. Miljøbelastningsindekset kan anvendes til at fastsætte grænser for krav til miljøgodkendelser

3.1.3 Beslutning om type emissioner, der reguleres

Der sker i referencelandene, inklusive Tyskland, som med hensyn til husdyrtæthed i gennemsnit ligger væsentligt under Danmark, regulering på basis af ammoniak og lugt, og desuden også på basis af støvemissioner og (i mindre omfang) bioaerosoler. Husdyrhold, specielt fjerkræproduktion og i mindre grad svineproduktion, er en væsentlig bidragsyder til luftens indhold af støv. EU stiller med Luftkvalitetsdirektivet (2008/50/EF) krav til at medlemslande fastsætter øvre grænser for god luftkvalitet med hensyn til PM2.5 og PM10, dvs. støvpartikler (particulate matter) med en diameter på under 2,5 mikrometer og 10 mikrometer.

Ingen af landene foretager regulering af emissioner af drivhusgasser. I Estland beregner dog man i forbindelse med miljøgodkendelser husdyrenes emissioner af lattergas (N_2O), der i lighed med anden emission af N anvendes som basis for en miljøbeskatning af miljøgodkendte virksomheder.

TABEL 1:TYPER AF EMISSIONER, SOM REGULERES.

	Holland	Belgien (Flandern)	Tyskland	Estland	Finland
Typer af emissioner, som reguleres	• Ammoniak • Lugt • PM10	• Ammoniak • Lugt • PM10 • PM2,5	• Ammoniak • Lugt • PM10 • Total støv • (Bioaerosoler)	• Ammoniak • Methan • Lattergas	• Ammoniak[9]

[9] Emissionskoefficienter findes, men regulering er endnu ikke iværksat.

3.1.4 Officielle emissionskoefficienter samt tilhørende grænseværdier

Referencelandene har et sæt emissionskoefficienter samt grænseværdier:

- For Belgien beskriver vejledningen for husdyr (http://www.lne.be/themas/milieueffectrapportage/deskundigen/richtlijnenboeken/rlb-landbouwdieren-2011.pdf) i bilag 2 emissionsfaktorer for forskellige typer og staldtyper. Afsnit 7.1 beskriver konkret grænseværdier for lugt og støv og hvordan det estimeres. I tilfælde af at en VVM redegørelse udarbejdes estimeres kvælstofdeponeringen indenfor en radius på 700 meter fra den planlagte stald, og tabel 7.6.2 of angiver grænseværdier for dette, fx 15 kg N per år for ekstensive, våde enge.
- I Tyskland definerer TA Luft (http://www.umweltbundesamt.de/luft/messeinrichtungen/TALuft_020724.pdf) grænseværdier for relevante emissionstyper (ammoniak – afsnit 5.2.4, støv - afsnit 5.2.1), mens bestemmelser om grænseværdier for lugt fastsættes på Bundesländer-niveau. Tilhørende emissionskoefficienter findes også i TA Luft (ammoniak (kg/(AP a)) – annex 1 table 11, lugt – afsnit 5.4.7.1 tabel 10 samt VDI vejledningens tabel 22 (http://www.vdi.de/uploads/tx_vdirili/pdf/1802148.pdf), og støv - VDI vejledningen).
- I Holland findes emissionsfaktorer for ammoniak i lov om husdyr og ammoniak, artikel 2. Som udgangspunkt skal ammoniakemissionerne reduceres til det halve af det, som er gældende for konventionelle stalde. Højst tilladte ammoniakudledninger er for eksempel 1,4 kg pr staldplads årligt for svin fra 25 kg til 7 måneder. Koefficienter for ammoniak emissioner forskellige husdyr typer i forskellige stalde findes i http://wetten.overheid.nl/BWBR0019211/geldigheidsdatum_03-09-2013. Tilsvarende findes emissionsfaktorer m.v. for lugt (http://wetten.overheid.nl/BWBR0020711/geldigheidsdatum_03-09-2013) og støv (http://www.rijksoverheid.nl/documenten-en-publicaties/publicaties/2013/03/15/emissiefactoren-fijn-stof-voor-veehouderij-2013.html).

Referencelandene administrerer emissioner i miljøgodkendelser af husdyrbrug på den måde, at de for hver type emission de regulerer har officielle tabeller med emissionskoefficienter, og ligeledes har fastsat grænseværdier.

3.1.5 Spredningsmodeller

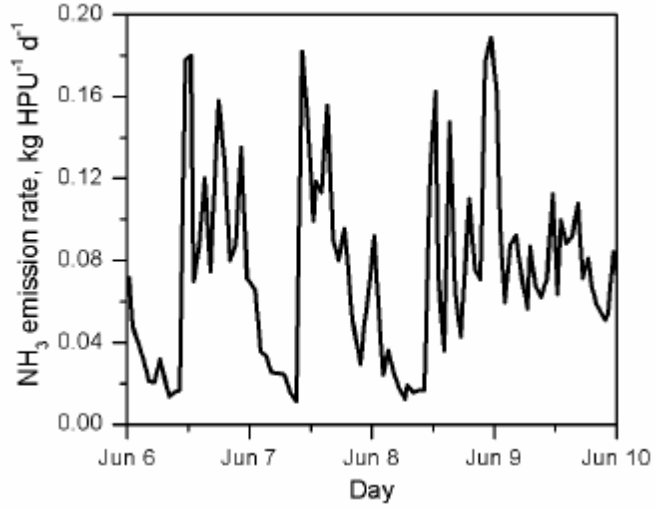
De primære referencelande anvender spredningsmodeller til estimering af nødvendig afstand fra staldkomplekset til naboer, sårbare arealer m.v.

Spredningsmodellerne anvendes i Tyskland og Holland i tilfælde af, at generelle afstandskrav ikke er overholdt, for at vurdere om staldkomplekset vil medføre gener selvom afstanden er mindre. Typisk vil emissionerne spredes mere med den fremherskende vindretning. Spredningsmodellerne kan også direkte anvendes til at beslutte, hvad en nødvendig afstand er i tilfælde af, at man ligesom i Flandern ikke har fastsat generelle afstandskrav.

I Holland og Flandern anvendes spredningsmodellerne til dels at estimere direkte effekter, men desuden også en akkumuleret effekt, sådan at man kan vurdere betydningen af et staldanlæg på luftkvaliteten i et lokalområde. Metoden til dette er at akkumulere effekter fra samtlige staldanlæg og andre faciliteter eller aktiviteter i området, der påvirker luftkvaliteten. Der kan på denne måde forekomme tilfælde, hvor de direkte effekter er acceptable, men et byggeprojekt må afvises på grund af de akkumulerede effekter. Spredningsmodellerne er således i stand til at håndtere emissioner, såvel som immissioner.

Grænseværdierne for luftkvalitet eller nedfald af kvælstof er en del af grundlaget for at afgøre om en given spredning er acceptabel eller ej. Derfor er der grænseværdier tilknyttet de emissioner man ønsker at regulere, fx 15 kg N deponeret per ha per år på våde engarealer i Flandern. For lugt er det

hovedregelen at staldanlægget ikke må kunne lugtes ved naboer. Imidlertid er husdyrproduktion en biologisk aktivitet, hvilket i sig selv giver variationer i emissionerne, men dertil kommer at skiftende vejrforhold påvirker spredningen af emissionerne meget, og man må derfor arbejde ud fra gennemsnit.



FIGUR 2: EKSEMPEL PÅ AMMONIAK EMISSION FRA EN ÅBEN, NATURLIGT VENTILERET KVÆGSTALD (WU ET AL., 2012)

I tilfælde af lugt, som er langt den mest centrale emission i forhold til naboer, er der af hensyn til variationerne fastsat bestemmelser om, at naboerne må acceptere en vis lugt i 2 % af tiden (Holland).

TABEL 2:ANVENDTE SPREDNINGSMODELLER.

	Holland	Belgien (Flandern)	Tyskland	Estland	Finland
Anvendte spredningsmodeller	• V.STACKS	• IFDM	• TA Luft + GIRL	-	-

3.2 Overordnet beskrivelse af administrative erfaringer hos den udøvende myndighed

Det fremhæves i referencelandene, at de definerede staldtyper anvendes som tjekliste i forbindelse med kontrolbesøg på husdyrbrug, og at dette ses som en rationaliseringsgevinst. I Belgien lagde en af de besøgte institutioner dog ikke skjul på, at systemet var indført af politikere, som blot ønskede at kopiere systemet fordi det var Hollandsk, men at systemet besværliggør introduktion af innovativ miljøteknologi på markedet, fordi dette i princippet først kan ske når den nye teknologi er indarbejdet i alle staldbeskrivelser. Der er også en stigende erkendelse af at emissioner har relation til både fodring, gulvudformning og andet design, luftrensning samt management, og at det danske system med individuel vurdering af miljøteknologier er en god måde, da det tillader landmanden at konfigurere sin stald på den mest optimale måde, og letter indførelse af innovative teknologier.

I Belgien føler man sig ikke overbevist om at specielt svinebrug overholder betingelserne om det maksimale antal husdyr de må have i stalden jf. deres miljøgodkendelser. Årsagen til dette er, at man på svinebrug ikke identificerer og indberetter hvert enkelt dyr til det centrale offentlige

husdyrregister, og man mener således at mange svinebrug har 10% flere svin end de har tilladelse til.

I Holland fremhæver man at det er en administrativ lettelse, at husdyrbrug under IPPC-farm størrelse ikke skal gennemgå en ansøgningsproces, men alene notificerer deres produktion. Det giver desuden en lettelse at disse husdyrbrug kun får kontrolbesøg hvert tredje år, mod hvert år for husdyrbrug med miljøgodkendelse.

3.3 Opgørelse af emissioner

Referencelandene opgør emissioner i ansøgningsfasen, idet man multiplicerer antal staldpladser til husdyr af given kategori og type, med de officielt fastlagte emissionsfaktorer, der er gældende for den staldtype, som ønskes taget i anvendelse.

3.4 Krav til teknologier

I relation til teknologier så har både Holland og Belgien bestemt, at nye stalde, eller væsentligt renoverede stalde, skal medføre 70 % lavere emission af ammoniak end en konventionel stald uden installering af luftrensningsteknologi. De staldtyper, som overholder dette er beskrevet i Belgien (Flandern) i et samlet dokument (http://www.lne.be/themas/milieueffectrapportage/deskundigen/richtlijnenboeken/rlb-landbouwdieren-2011.pdf), mens det i Holland er beskrevet i en række "byggeblade" (fx http://www.infomil.nl/publish/pages/72318/bwl_2008_01_v1.pdf). I Tyskland anvendes principielt det samme system med byggeblade (refereret til i VDI vejledningen (http://www.vdi.de/uploads/tx_vdirili/pdf/1802148.pdf), men her findes ikke på samme vis en fast definition af at nye stalde skal medføre en given emissionsreduktion. Det fremgik dog uofficielt af besøget i Tyskland, at der sandsynligvis indføres krav om at fx stalde af en given størrelse til svin altid skal udstyres med luftrensningsteknologi.

3.5 Overordnet beskrivelse af myndighedens kontrol og tilsyn med emissioner

Hvis man ønsker at indføre en regulering der baseres på faktisk målte værdier, er det helt afgørende at der eksisterer teknologier til monitering af luftkvaliteten i relation til ammoniak, lugt og drivhusgasser. I den forbindelse oplyser myndighederne i referencelandene enstemmigt, at de ikke anvender sådanne instrumenter eller sensorer i kontrollen med de miljøgodkendte husdyrbrug.

Den følgende tabel viser, hvilke parametre der kontrolleres på miljøgodkendte husdyrbrug i referencelandene.

TABEL 3: PARAMETRE, DER KONTROLLERES PÅ MILJØGODKENDTE HUSDYRBRUG.

	Holland	Belgien (Flandern)	Tyskland	Estland	Finland
Parametre, der kontrolleres på husdyrbrug med miljøgodkendelse	• Antal husdyr og type husdyr • Staldtype	• Antal husdyr og type husdyr • Staldtype	• Antal husdyr og type husdyr • Staldtype	• Antal husdyr og type husdyr	-

3.6 Overordnet beskrivelse af husdyrbrugets evt. forpligtigelser til indberetning, emissionsopgørelse osv.

Referencelandene stiller ingen krav om registrering eller indberetning af aktuelle emissioner, men alene om at registrere antal husdyr jf. gældende lovgivning. I tilfælde af at en miljøgodkendelse (eller bindende regler) foreskriver anvendelse af luftrensning, er der stigende krav om at husdyrbruget via logbøger kan dokumentere, at luftrensningsteknologien rent faktisk er anvendt, og ikke kun installeret.

3.7 Overordnet beskrivelse af ansøgningssystem og procedurer

Referencelandene adskiller sig vedrørende miljøgodkendelser i forhold til anvendte procedurer for forskellige besætningstyper og størrelser, samt administrativ myndighed.

Alle primære referencelande anvender udtrykket IPPC-farme om de husdyrbrug, der jf. Direktivet om Industrielle Emissioner skal have en miljøgodkendelse, i mange tilfælde med offentlig høring som en del af processen.

I både Tyskland og Flandern skal stort set alle husdyrbrug have en miljøgodkendelse, men ikke i Holland. Her taler man om bindende regler (binding rules), som alle skal overholde, inklusive krav til emissioner, uanset om man har en miljøgodkendelse eller ej.

I Holland er kommunen den administrative myndighed, og i Flandern det flamske miljøministerium (Environment, Nature and Energy Department of the Flemish Government - LNE) via regionale kontorer. I Tyskland har de enkelte Bundesländer en forskellig institutionel organisering, og med Schleswig-Holstein som eksempel foretages administrationen af miljøgodkendelser af LLUR (Landesamt für Landwirtschaft, Umwelt und ländliche Räume), idet dog mindre husdyrbrug skal meddele deres husdyrhold til lokale bygningsinspektorater (Kreisbauämter).

I alle tilfælde anvendes forenklede ansøgningsprocedurer, hvilket betyder at en miljøgodkendelse basere sig på an vurdering af alle landbrugs-miljø relateret lovgivning, og at husdyrbrugeren således ikke skal ansøge flere steder.

I både Holland og Flandern er en husdyrproduktion afhængig af at ejeren er i besiddelse af det nødvendige antal hussdyr-rettigheder, som i Flandern misvisende kaldes for emissionsrettigheder. Disse rettigheder er en omsættelig kvote, som er indført for at sikre at husdyrholdet som helhed ikke stiger i landet. I Belgien handles rettighederne via VLM, der i forbindelse med omsætningen fortolder rettighederne ved omsætningen, således at husdyrbestanden i Flandern gradvis sænkes.

Referencer

Generelt

6. Adamsens, Anders Peter S. og Anders Feilberg. 2013. Udfordringer og muligheder for emissionsbaseret regulering af husdyrproduktionen. Indlæg på seminaret "En ny start for grøn vækst - hvordan og hvornår." http://agro-technology-atlas.eu/docs/nystartseminar/APSA_Emissionsbaseret_regulering_af_husdyrproduktionen.pdf
7. En ny start. Natur og Landbrugskommissionen. 2013. http://www.naturoglandbrug.dk/slutrapport_2013.aspx?ID=52071
8. EUROPA-PARLAMENTETS OG RÅDETS DIREKTIV 2010/75/EU af 24. november 2010 om industrielle emissioner (integreret forebyggelse og bekæmpelse af forurening) - http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:334:0017:0119:DA:PDF (Direktivet om Industrielle Emissioner)
9. EUROPA-PARLAMENTETS OG RÅDETS DIREKTIV 2008/50/EF af 21. maj 2008 om luftkvaliteten og renere luft i Europa Natur og Landbrug. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:0044:DA:PDF (Luftkvalitetsdirektivet)
10. Eurostat, husdyrstatistik - http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do
11. Poulsen, Hanne Damgaard (ed.). 2012. Normtal for husdyrgødning - 2012. 33 sider. http://anis.au.dk/fileadmin/DJF/Anis/Normtal_2012_august_ny_2012.pdf
12. Verification of Environmental Technologies for Agricultural Production (VERA) Test Protocols - http://veracert.eu/en/technology-manufacturers/test-protocols/

Flandern

13. Decreet van 22 december 2006 houdende de bescherming van water tegen de verontreiniging door nitraten uit agrarische bronnen (På dansk: Flamsk gødningsbekendtgørelse). http://www.vlm.be/SiteCollectionDocuments/Regelgeving/Mestbank/lw%2001%2003%202013%20-%20BS%2015%2004%202013.pdf
14. Els Willems, Tine Monseré & Jef Dierckx. 2011. Geactualiseerd richtlijnenboek milieueffectrapportage „Basisrichtlijnen per activiteitengroep – Landbouwdieren" (På dansk: Opdaterede miljømæssige retningslinjer "Grundlæggende retningslinjer for aktivitetsgruppe – Husdyr". http://www.lne.be/themas/milieueffectrapportage/deskundigen/richtlijnenboeken/rlb-landbouwdieren-2011.pdf
15. Emissiearme stallen (På dansk: Lav-emissions stalde). Vlaamse Landmaatschappij (VLM). http://www.vlm.be/landtuinbouwers/mestbank/emissiearmestallen/Pages/default.aspx#1
16. MIRA. Livestock in Flandern. http://www.milieurapport.be/en/feitencijfers/miratree/sectors/agriculture/activities-of-agriculture/livestock/.
17. VLAREM. Vlaams reglement betreffende de milieuvergunning – på dansk: Flamsk miljølovgivning. VLAREM har to dele: VLAREM I indeholder bestemmelser om procedure, og VLAREM II de specifikke bestemmelser for forskellige industrier – kapitel 5.9 vedrører husdyrhold. http://navigator.emis.vito.be/milnav-consult/consultatie;jsessionid=500161E9A3E4EE67E0725C6DA3EB9348?language=en.

Estland

18. INTEGRATED POLLUTION PREVENTION AND CONTROL - Best Available Techniques for Intensive Rearing of Cattle. Environmental Investment Centre. 74 pp. http://www.ippc.envir.ee/docs/PVT/BAT%20for%20Intensive%20Rearing%20of%20Cattle.pdf.
19. Keskkonnatasude seadus (lühend - KeTS) (på dansk: Lov om miljøafgifter). https://www.riigiteataja.ee/akt/116052013013.
20. Looma- ja linnukasvatusest välisõhku eralduvate saasteainete heitkoguste määramismeetodid (på dansk: Bestemmelser om emissioner fra kvæg og fjerkræ). https://www.riigiteataja.ee/akt/13086529.

Tyskland

21. Düngeverordnung - http://www.gesetze-im-internet.de/bundesrecht/d_v/gesamt.pdf (på engelsk: http://www.bmelv.de/SharedDocs/Rechtsgrundlagen/EN/F/Fertilisation-Act.html)
22. Emissions Control Act (Bundes Immisions Scutzt Gesetz (BimSchG), http://www.gesetze-im-internet.de/bundesrecht/bimschg/gesamt.pdf
23. Emissions Control Cabinet Regulation (Bundes Immisions Scutzt Verordnung (BImSchV), http://www.bmu.de/service/publikationen/downloads/details/artikel/verordnung-ueber-kleine-und-mittlere-feuerungsanlagen-1-bimschv/.
24. Environmental Impact Assessment Act (UVPG), http://www.gesetze-im-internet.de/uvpg/anlage_1_62.html.
25. Geruchsimmissions-Richtlinie (Vejledning om detection og vurdering af lugt i luften), http://www.lanuv.nrw.de/luft/gerueche/bewertung.htm#1.
26. TA Luft: Technische Anleitung zur Reinhaltung der Luft - http://de.wikipedia.org/wiki/Technische_Anleitung_zur_Reinhaltung_der_Luft og http://www.umweltbundesamt.de/luft/messeinrichtungen/TALuft_020724.pdf (TA Luft på engelsk: http://www.bmu.de/fileadmin/bmu-import/files/pdfs/allgemein/application/pdf/taluft_engl.pdf)
27. VDI Richtlinien, http://www.vdi.de/uploads/tx_vdirili/pdf/1802148.pdf (kun en del af vejledningen er tilgængelig via dette link)

Holland

28. The Environmental Management Act, http://www.eui.eu/Projects/InternationalArtHeritageLaw/Documents/NationalLegislation/Netherlands/environmentalmanagement2004.pdf.
29. Besluit ammoniakemissie huisvesting veehouderij (Bestemmelse om ammoniakemissioner fra husdyrstalde), http://wetten.overheid.nl/BWBR0019211/geldigheidsdatum_03-09-2013
30. Regeling ammoniak en veehouderij (Bekendtgørelse om ammoniak og husdyrregulering), http://wetten.overheid.nl/BWBR0013629/geldigheidsdatum_03-09-2013.

31. BWL 2008.01.V1 - Biologisch luchtwassysteem 70 % ammoniakemissiereductie (lav-emissionsstald, biologisk luftrensning, 70% ammoniakemissions reduktion), http://www.infomil.nl/publish/pages/72318/bwl_2008_01_v1.pdf.
32. Regeling geurhinder en veehouderij BWL2006333382 (Bekendtgørelse om lugt fra husdyr), http://wetten.overheid.nl/BWBR0020711/geldigheidsdatum_03-09-2013.

Bilag I: Sammenfatning vedrørende screening af lande for erfaringer med emissionsbaseret regulering af husdyrbrug

Miljøstyrelsen ønsker en undersøgelse af, om andre husdyrintensive lande i fortrinsvis Nordeuropa har erfaringer med anvendelse af emissionsbaserede reguleringsformer, som er relevante i relation til anbefalinger fra Husdyrreguleringsudvalget samt Natur- og Landbrugskommissionens rapport. Det anbefales at skifte fra den nuværende reguleringsform, der tager udgangspunkt i dokumenteret produktionsomfang, i nogle tilfælde kombineret med krav om anvendelse af miljøteknologier med verificeret effekt på emissioner af NH3, lugt og drivhusgasser (sidstnævnte fx via energiforbrug), til en emissionsbaserede reguleringsform, hvor dokumentationskravet flyttes til emissionsrettighederne i miljøgodkendelsen, og hvor produktionsomfanget er helt uden eller af mindre betydning.

Prioriteringen af de lande, som vil være mest relevante at indhente erfaringer fra bygger i høj grad på en spørgeundersøgelse, idet en litteraturundersøgelse samt opstillede indikatorer bekræfter spørgeundersøgelsen, samt forklarer, hvorfor disse lande har fokus på emissioner fra husdyr.

Indikatorer vedrørende husdyrtæthed, intensitet af store husdyrbrug, befolkningstæthed, omfang af naturfølsomme arealer samt internationale forpligtelser vedrørende emissionsreduktioner, er anvendt til vurdering af, hvilke EU lande der kan forventes størst interesse for emissioner i.

Det kan på basis af en spørgeundersøgelse omfattende 23 lande, heraf 19 EU lande og 4 oversøiske/andre lande, konkluderes at er ikke findes emissionsbaseret regulering i noget andet land. Der findes imidlertid i 11 lande, heraf 3 oversøiske/andre lande, en regulering af husdyrbrug, der til dels er baseret på emissioner.

Den følgende tabel oplister de mest relevante lande på basis af screeningen, idet der maksimum er oplistet 12 lande i hver kolonne:

Land	Indikatorer	Spørgeundersøgelse	Litteratur	Samlet rangering
Holland	1	1	1	1
Tyskland	2	2	2	2
Belgien, Flandern	3	3		3

Estland		4		4
Østrig		5	3	4
Rusland		6		6
Italien	6			6
Litauen		7		7
Finland		10	4	7
Malta	7			7
Frankrig	5		9	7
Storbritannien	4		10	7
Japan		11	5	8
Irland			8	8
Slovakiet	8			8
Tjekkiet	9	9		9
Spanien	10		7	8,5
Iowa, USA		12	6	9
Polen	12	8		10
Portugal			11	11
Ungarn	11			11
Sverige			12	12

Det foreslås på denne baggrund at søge yderligere oplysninger fra

- Holland, Tyskland og Belgien, idet alle tre lande allerede har en vis form for emissionsbaseret regulering. Tyskland er naboland og Belgien og Holland er tæt på Danmark, og erfaringer herfra vil forholdsvist nemt kunne overføres til danske forhold. For Tyskland er det nærmere betegnet delstaten Schleswig-Holstein, som det vil være mest nærliggende at besøge, samt evt. føderale myndigheder i Berlin. For Belgien er det den flamske del, der er interessant i denne sammenhæng. Tyskland og Hollands regulering af emissioner baserer sig på kvantificering af de enkelte husdyrs emissioner. Holland og Flandern har beskrevet staldtyper med emissions-reducerende effekt.
- Oversøisk / blandt andre lande kan de overvejes at besøge Rusland og/eller Japan for at få inspiration.

Screeningen er baseret på ikke-videnskabelige metoder.

Bilag II: Information about emission regulation of Flemish livestock farming

This section is written in English language and confirmed by the Flemish experts listed below.

II.1: The Flemish context

Flanders is one of the European regions with the highest population density; here lives 6.2 million people on an area of 13,522 km², a quarter of Denmark's size. In addition to this there are about 6.3 million pigs, 1.3 million cattle and 30 million chickens in the region, and since 2008, pig and poultry numbers have been increasing due to the possibilities for expansion created under the manure policy since 2007[10].

There are relatively many large livestock farms in the region, and 575 are categorised as "IPPC farms", meaning pig or poultry farms larger than the minimum threshold according the IED Directive (2010/75/EU).

Flanders is one of three regions in Belgium, besides Wallonia and Brussels, ruled by the Flemish Government. Environment is a regional responsibility - each region has its own legislation and permitting system.

The used language is Dutch and the cultural affiliation is to the Netherlands. The agro-environmental legislation in Flanders is highly inspired by the Dutch.

II.2: Key provisions in Flemish agro-environmental legislation

In the following is presented some central decisions in the Flemish agro-environmental legislation, with comments and reference to the legal document:

Decision	Legal document reference	Comments
All livestock farms over a minimum threshold need an environmental approval.	VLAREM[11] I, annex I, Section 9: ANIMALS	Farms are divided in class 1, 2 or 3, according their size. Category 1 is the largest livestock farms, and the largest of them are IPPC farms, whereof the majority in connection to the permit

[10] http://www.milieurapport.be/en/feitencijfers/miratree/sectors/agriculture/activities-of-agriculture/livestock/
[11] http://navigator.emis.vito.be/milnav-consult/consultatie;jsessionid=500161E9A3E4EE67E0725C6DA3EB9348?language=en

		process are undergoing an Environmental Impact Assessment. Category 3 farms are the smallest, and they need only to notify their operation to the authorities.
The maximum number of animals in each animal housing type is limited by the type and size of housing according to technical agricultural standards. The maximum number of animals indicated in the licence or in the notification may not be exceeded.	VLAREM II, chapter 5.9 (animals), article 5.9.8.4 §2	The control is done as animal welfare by the Federal Food Agency (will become soon Flemish matters).
Storage sites for slurry: …capacity shall be raised to a quantity corresponding to 9 months in the case of animals kept permanently in stalls… Slurry tanks have to be covered.	Article 5.9.2.3. § 1	
Excepting the required vent pipes, storage sites located outside the animal housing must be closed off from the open air.	Article 5.9.2.3. § 4.	
…the new to be built animal housing (pigs and poultry) must be low in ammonia emissions if, for the animal category concerned, a technique is included in the list of low ammonia emission animal housings established by the order of the Flemish minister competent for the environment.	Article 5.9.2.1 bis. § 1	Low emission stables are described in this document http://tinyurl.com/kugpe4r. The stables ensure that ammonia emissions are at least 70% lower than the baseline. New to be built animal housing means completely new or strongly renovated.
Livestock farms can only operate if they have nutrient emission rights.	Personal information, VLM Mestbank.	Emission rights are based on ex-animal figures, and they are actually not expressing the right to emit, but rather the right to introduce nutrients into the manure cycle. The rights are fixed and do not change from year to year. The emission rights determine the

		number of animals a farm can keep. The emission rights are freely traded, and trades notified to VLM Mestbank, who keep a register of the rights, and deduct the trades with 25%, which in this way is taken out of the market. There is a fixed relation between N and P in the emission rights. Rights amounts 300 million kg N, and every year around 1 million is taken out. The current market price is 4 € for cattle and 1-2 € for other animals – it was originally around € 8. A dairy cow requires 127 emission rights. There is a problem in introducing the rights for free, and later on making it possible to sell them (drains the farming sector for assets).
"Surplus manure" is the manure that cannot be used as fertiliser on own fields, and it have to be processed and moved away from the farm.	Personal information, VLM Mestbank.	Those, who cannot document, what happened to the surplus, are fined. This is not written direct in legislation, but rather the effect of legislative regulations.

II.3: Technologies to measure emissions

The situation in Flanders is that emissions are estimated and modelled on basis of animal numbers and a related manure standard, also including emission factors. The emissions factors for ammonia, particulate matter and odour are found at a document describing the procedures for Environmental Impact Assessments - http://www.lne.be/themas/milieueffectrapportage/deskundigen/richtlijnenboeken/rlb-landbouwdieren-2011.pdf, appendix 2.

It is according to ILVO possible to measure emissions of ammonia, odour, particulate matter, methane and laughing gas, however, there are not developed methods or technologies that on a real-time basis are economically feasible.

IPPC farms, for which an initial screening clarifies the relevance of an Environmental Impact Assessment to be performed, would concerning particulate matter and odour be estimated for impacts. The estimate is done by the consultant who assists the farm in preparing the environmental permit application, by use of the IFDM dispersion model, which is developed by VITO. This model is, apart from the scoring system to determine distances from installations to neighbours etc. used for calculation of required distances. It would often be so that the concrete location of the livestock house, for instance in relation to the prevailing wind direction, would have considerable impacts on the required distances. The IFDM model takes not only the planned

livestock house into account, but also other nearby installations for livestock rearing in order to be able to estimate the complete concentration of odour and participate matter on the location. This means that other, already permitted installations for livestock rearing nearby could hinder new ones to be permitted.

The document here http://www.lne.be/themas/milieueffectrapportage/deskundigen/richtlijnenboeken/rlb-landbouwdieren-2011.pdf describes in section 7.1 concretely limit values for odour and particulate matters and how it is estimated.

In case an Environmental Impact Assessment is performed, there would be made estimates of the N deposition from ammonia emissions within a radius of 700 metres from the planned installation. Table 7.6.2 of the http://www.lne.be/themas/milieueffectrapportage/deskundigen/richtlijnenboeken/rlb-landbouwdieren-2011.pdf shows the critical load of N deposition for areas of different type, for instance 15 kg N per year for "Poor, wet grassland".

II.4: Enforcement

Enforcement is based on administrative checks and physical inspections.

- LNE would mainly via physical inspections control that the conditions for the environmental permits are complied with, here under that the BAT's are installed and used as foreseen. LNE is more and more asking for log books to be kept by the farms, for instance to prove that air cleaning techniques are used and not only installed.
- VLM performs administrative controls based on the Herd and Animal Register they keep combined with the manure standards found in the Fertilising Decree - http://www.vlm.be/SiteCollectionDocuments/Regelgeving/Mestbank/lw%2001%2003%202013%20-%20BS%2015%2004%202013.pdf and the number of emission rights each farm has.
- VLM undertake as well physical inspections of the farms to control the compliance between the actual number of animals and the registered number.

II.5: Key institutions in implementing emission based regulations

II.5.1: Environment, Nature and Energy Department of the Flemish Government (LNE)

LNE is responsible for implementation of legislation dealing with emissions from livestock farms. The legislation has since 1991 been gathered in one large legal document of several hundred pages, VLAREM, which is an abbreviation of Vlaams reglement betreffende de milieuvergunning – in English: The Flemish environmental regulation. VLAREM is divided in two parts: VLAREM I holds provisions about procedures, and VLAREM II the specific regulations for different industries – chapter 5.9 deals with livestock farming. The legislation is found at http://navigator.emis.vito.be/milnav-consult/consultatie;jsessionid=500161E9A3E4EE67E0725C6DA3EB9348?language=en.

The Flemish environmental legislation is found at http://navigator.emis.vito.be/milnav-consult/.

LNE organises via the Environmental Licences Division appraisal of environmental permit applications, as well as the enforcement of it, here under physical inspection of farms. LNE also accredits BAT's (Best Available Techniques).

In Flandern is introduced the principle of one integrated permit for one plant, meaning that farmers wishing to build a new livestock installation only needs to make one application, and the permit granted covers all relevant legislation (air, water, soil, waste, raw materials, external safety,...).

There are in total about 1,200 IPPC installations, whereof 575 are installations for intensive livestock rearing. The granted permits are maximally valid for 20 years.

Web: http://www.lne.be.

II.5.2: Flemish Land Agency (VLM)

VLM holds a department called VLM Mestbank (Manure bank), which a. o. is responsible for keeping the Herd and Animal Register, and for the implementation of the Fertilising Decree - http://www.vlm.be/SiteCollectionDocuments/Regelgeving/Mestbank/lw%2001%2003%202013%20-%20BS%2015%2004%202013.pdf.

VML's responsibility is also to

- Calculate farms emission rights (i.e. the nutrients introduced in the manure cycle - ex animal);
- Keep a register of farms emission rights;
- Keep a list of BAT's, i.e. the low ammonia emission stables - http://www.vlm.be/landtuinbouwers/mestbank/emissiearmestallen/Pages/default.aspx#1

Web: http://www.vlm.be.

II.5.3: Flemish Technological Investigations Institute (VITO)

VITO is appointed to represent Belgium in the Technical Working Group at the European IPPC Bureau. VITO was behind the development of the BAT methodology and has also proposed the BAT AEL (BAT Associated Emission Levels) methodology, which are also introduced at European level in the context of the BREF revision process.

VITO has, as mentioned above, also developed the IFDM model for estimation of emissions and emissions of odour and particulate matter.

Web: http://www.vito.be.

II.5.4: Institute for Agricultural and Fisheries Research (ILVO)

In general it is ILVO's mission to perform and coordinate policy-supportive scientific research and the associated public service with an eye toward economically, ecologically and socially sustainable agriculture and fisheries.

In specific they perform research on emissions and air flow modelling and analysis, and do this via a number of research projects such as PigDust, MultiPol, Odour, AirScrub and AirModel.

One researcher is until end of 2015 employed via co-financing from LNE and VLM to deal with reference tasks concerning emissions (techniques to measure emissions, emission factors, emission effects, reducing nuisances, etc.) and sustainable production techniques.

ILVO has developed the scientific basis for the BAT's describing low emission stables - http://www.vlm.be/landtuinbouwers/mestbank/emissiearmestallen/Pages/default.aspx#1. The document provides a definite number of livestock houses, for instance seven different types for fattening pigs (code V-4) that due to their design would ensure the ammonia emission are at least 50% lower than the reference baseline. The specific technologies to ensure this deals for instance with design of the floors and the slurry channels, cooling of slurry channels, and air cleaning technology.

ILVO has recently accepted to enter into the cooperation with Denmark and other countries about the EU ETV AGRI pilot project.

Web: http://www.ilvo.vlaanderen.be/.

II.5.5: Flemish Coordination Centre for Manure Processing (VCM)

VCM (Flemish Coordination Centre for Manure Processing) is an intermediary platform between the government and the sector, established by a public-private partnership consisting of stakeholders related to manure processing, and as such closely following the challenges of livestock farming, and via its activities working for finding solutions to the satisfaction of its founders.

VCM has no formal role in the emission based regulation of Flemish livestock farms, but is more undertaking a facilitating role.

VCM organises within the frames of the ARBOR project a ManuREsource2013 conference in December 2013 - http://www.manuresource2013.org/.

Web: http://vcm-mestverwerking.be/.

II.6: List of people met

- Robrecht Vermoortel, robrecht.vermoortel@lne.vlaanderen.be, LNE, Brugge
- Ilse De Vreese, ilse.devreese@lne.vlaanderen.be, LNE, Brugge
- Chris Colaert, chris.colaert@lne.vlaanderen.be, LNE, Brugge
- Vanessa Reynaert, vanessa.reynaert@lne.be, LNE, Brussels (correspondence via e-mail)
- Annick Goossens, Annick.Goossens@vlm.be, VLM
- Ineke Van de Steene, ineke.vandesteene@vlm.be, VLM
- An Derden, an.derden@vito.be, VITO
- Peter Demeyer, peter.demeyer@ilvo.vlaanderen.be, ILVO
- Eva Brusselman, eva.brusselman@ilvo.vlaanderen.be, ILVO
- Viooltje Lebuf, viooltje.lebuf@vcm-mestverwerking.be, VCM, Brugge
- Céline Schollier, VCM, Brugge

Bilag III: Information about emission regulation of Estonian livestock farming

This section is written in English language and confirmed by the Estonian expert listed below.

III.1: The Estonian context

Estonia has compared to other Baltic countries a structure in livestock production with averagely rather large herd sizes, although the overall livestock density is rather low. There are 40 IPPC farms in Estonia, whereof 34 pig farms and 6 poultry farms. Apart from this, also dairy cattle farms with more than 300 dairy cows needs environmental approval.

III.2: Key-provisions in Estonian legislation

In the following is presented some central decisions in the Estonian agro-environmental legislation, with comments and reference to the legal document:

Decision	Legal document reference	Comments
The environmental approval includes quotas on ammonia, methane and laughing gas, calculated on basis of livestock number and types in different housing systems.	This regulation https://www.riigiteataja.ee/akt/13086529 provides the method for calculating quotas.	
Farms are taxed according their quotas on ammonia and laughing gas.	Tax tariffs for ammonia and laughing gas are found in Act of environmental fee's - https://www.riigiteataja.ee/akt/116052013013	Methane is only calculated, not taxed.
Use of an agro-environmental technology with for instance 70% reduction effect on ammonia emissions, would entitle the farm to increase the		Emission reduction effects of agro-environmental technology is based on a "Technology list" like the Danish – there are not made any verification in Estonia, but

production in terms of animal numbers.

scientifically proven technology tests from abroad are used in Estonia (such as those found at http://agro-technology-atlas.eu).

III.3: Technologies to measure emissions

The situation in Estonia is that emissions are estimated and modelled on basis of animal numbers and a related manure standard, also including emission factors. The emissions factors for ammonia, methane and laughing gas are found in this document - http://www.ippc.envir.ee/docs/PVT/BAT%20for%20Intensive%20Rearing%20of%20Cattle.pdf.

III.4: Enforcement

The Estonian Environmental Inspectorate controls the farms in different ways, for instance via physical inspections, where the livestock number and types are counted and where it is controlled, that used agro-environmental technology is working as expected.

It is according Estonian Agricultural University not feasible to measure the air quality directly.

III.5: Key institutions in implementing emission based regulations

III.5.1: Ministry of the Environment

Ministry of the Environment has the overall responsibility for implementation of related legislation.

Information about the Ministry's activities with environmental approval of farms appears from the website - http://www.ippc.envir.ee/english/index.htm.

Web: http://www.envir.ee

III.5.2: Environmental Inspectorate

Environmental Inspectorate is a governmental authority under Ministry of Environment, responsible for control with compliance with environmental regulations on farms.

III.5.3: Estonian University of Life Sciences (EMU)

EMU provides the scientific background for standards and norms related with emission based regulation of livestock farms.

Web: http://www.emu.ee

III.6: List of people met

- Allan Kaasik, Allan.Kaasik@emu.ee, Estonian University of Life Sciences

Bilag IV: Information about emission regulation of Finnish livestock farming

This section is written in English language and confirmed by the Finnish expert listed below.

IV.1: The Finnish context

Finland has in general a low livestock density, as seen in the below table.

Number of pigs, cattle and chicken in EU Member States in 2009. Source: FAOSTAT.

EU Member States	Pigs	Cattle	Chickens (x 1000)
Denmark	12,369,145	1,540,340	19,224
Finland	1,381,207	918,268	4,918
TOTAL EU-27	153,226,384	88,493,237	1,284,963

However, the livestock density is much higher in the south-western part of Finland than in the rest of the country, and in combination with a sensitive nature, this situation is the reason for challenges to dispose of the livestock manure in a sustainable way in that part of the country.

IV.2: Key-provisions in Finnish legislation

Finland has currently no legislation concerning airborne emissions from livestock, but they consider introducing it. A work group on the issue will start its activities under Ministry of Environment in the autumn of 2013.

SYKE and MTT have for Ministry of Environment, and as a preparation of the working group, developed a proposal for an environmental impact index for livestock. The index, which takes into account the potential loss of nutrients from the livestock to the environment, therefore also for potential emissions, has the perspective to become a tool for establishing thresholds for environmental permitting.

At the moment, the Finnish permitting system is based on the phosphorus excretion per animal (place) per year. A reference animal is fattening pig. Its P excretion value is 2.5 kg P/animal place/year, and the animal unit factor is 1. Other animals are related to this. For example dairy cow's P excretion value is 17 kg P/animal/year and animal unit factor is 6.8.

For a new (proposed) system were created an environmental impact index (EII) for each animal category, based on the potential environmental impacts of animals, and using following compounds:

- N and P runoff from the field (very rough estimate on how much N and P is lost by runoff from applied manure N and P)

- Animal-specific NH3 emission factors (based on the emission factors from the Finnish ammonia emission model for agriculture). Emission factors include emissions from housing, storing and field.

GHGs[12] were not applied because the focus is on the local environmental impacts, not global. It is, however, possible to include GHGs to environmental impact index value later.

Odors were not applied due to lack of animal specific 'odor factors'. However, it is supposed that animal specific NH3-emission factors 'include' also smell effect.

Emissions of N, P and NH3 were transformed into environmental impact values using the characterization factors (an example of similar characterization factors is GHGs GWP[13]-factors). N, P and NH3 is transformed into aquatic and terrestrial eutrophication, acidification and particulate matter formation (secondary formation, due to NH3). Direct particle matter (dust) emissions from animals/animal farming were not considered.

$$Emission * characterization\ factor = environmental\ impact\ value$$

Impact category values were normalized using Finland specific normalization factors (normalization factor: e.g. Finland's total characterized value for acidification, based on total emissions of acidifying emissions).

Animal specific normalized impact category values were then combined into one single impact value using equal impact category weights. Also other weighting system could be applied.

After that, animal specific EIIs were got, and based on these values the animal unit factors were calculated fattening pig being again the reference animal and having the unit factor 1, Dairy cow having the new value of 9.7.

It is still under consideration, whether adjustments in the index calculation should take other factors into account.

IV.3: Technologies to measure emissions

N/A

IV.4: Enforcement

N/A

IV.5: Key institutions in implementing emission based regulations

IV.5.1: Ministry of the Environment

The Ministry has the overall responsibility for implementation of related legislation.

http://www.ymparisto.fi

[12] GHG = Green House Gas
[13] GWP = Global Warming Potential

IV.5.2: The Finnish Environment Institute (SYKE)

SYKE is a research institute and a centre of expertise providing knowledge and solutions enabling sustainable development. SYKE provides technical back-up to Ministry of the Environment, and is appointed to represent Finland in the TWG concerning installations for rearing of intensive livestock.

http://www.syke.fi

IV.5.3: MTT Agrifood Research

MTT Agrifood Research is an expert body working under the Finnish Ministry of Agriculture and Forestry with approximately 800 employees. MTT produce and disseminate scientific and applied research information and develop and promote the transfer of new technology for the agriculture and food sector as a whole.

Strategically MTT puts high emphasis on developing agrifood production into a more environmental, economical, energy efficient and socially sustainable direction.

MTT works in close co-operation with both the Ministry of Agriculture and Forestry and the Ministry of the Environment providing necessary information to the officials and making recommendations on different actions.

http://www.mtt.fi.

IV.6: List of people met

- Juha Grönroos, juha.gronroos@ymparisto.fi, Finnish Environment Institute (SYKE)
- Sari Luostarinen, sari.luostarinen@mtt.fi, MTT Agrofood Research

Bilag V: Information about emission regulation of German livestock farming

This section is written in English language and confirmed by the German expert listed below.

V.1: The German context

Germany is in comparison to Denmark a large country; not only is the area about 8 times larger than the Danish, but it is also more intensive both with respect to people and livestock. The number of citizens per km² is 231, approximately the double of the Danish 126, and livestock intensity is also among the highest in Europe, especially in the North-western parts of Germany, such as Niedersachsen and Schleswig-Holstein, two of Germanys' 16 Bundesländer.

V.2: Key-provisions in German legislation

A central legal document in the German emission regulation is the Emissions Control Act (Bundes Immisions Scutzt Gesetz (BimSchG - http://www.gesetze-im-internet.de/bundesrecht/bimschg/gesamt.pdf), under which the BImSchV (V = Verordnung, http://www.bmu.de/service/publikationen/downloads/details/artikel/verordnung-ueber-kleine-und-mittlere-feuerungsanlagen-1-bimschv/) Cabinet Regulation gives more details. A number of guidelines describe the procedures and methods for implementing parts of the regulations.

The key provisions dealing with emissions and livestock farming in Germany is listed in the following, with reference to the legal document in question as well as possible comments:

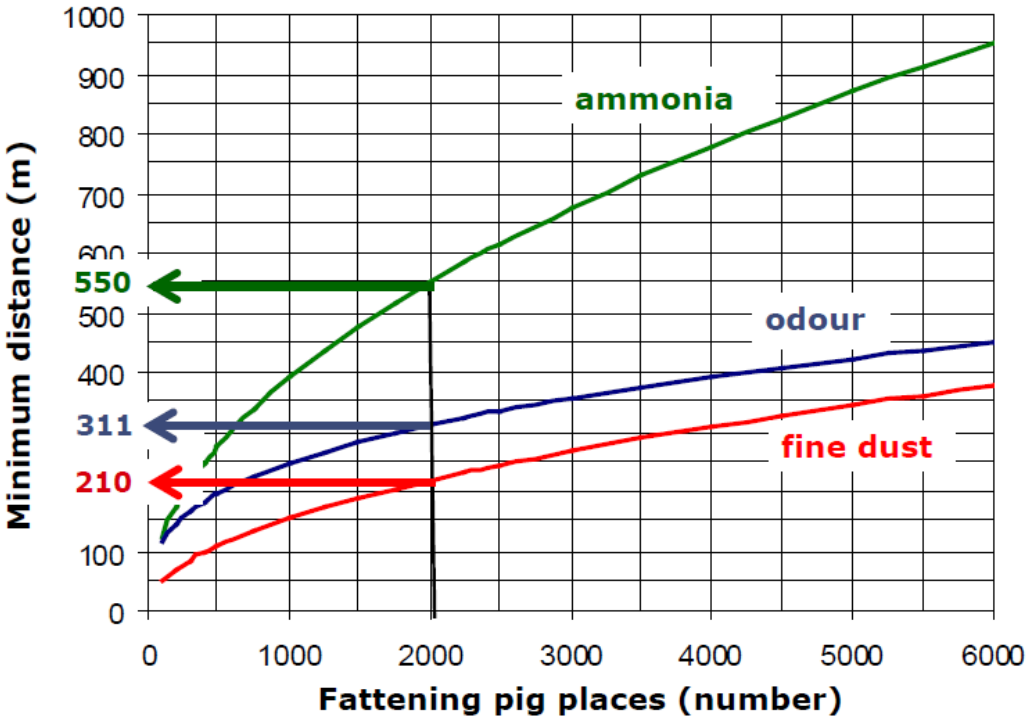
Decision	Legal document reference	Comments
Livestock farms above a certain threshold, counted in number of places for the livestock, can only operate in case they have an environmental approval.	BImSchG, §4-21 4. BImSchV	Thresholds are defined in the 4. BImSchV. The threshold is for instance 560 places for sows, 600 places for cattle, 30,000 broilers,

		etc.
Farms needs in connection to the environmental permit process to get an Environmental Impact Assessment in case they have more livestock than mentioned in that EIA Directive (2011/92/EU) (for instance 3,000 places for slaughter pigs over 30 kg), while the other might need an EIA in case a pre-assessment requires that. **Germany has in addition to the EIA Directive thresholds also defined additional thresholds for other types of livestock, for instance 6,000 piglets between 10 and 30 kg (see 4. BImSchV).**	BImSchG Environmental Impact Assessment Act (UVPG), Annex 1 - http://www.gesetze-im-internet.de/uvpg/anlage_1_62.html	
Environmental approvals are given to livestock farms according to a "precautious	BImSchG, §5 TA Luft: Technische Anleitung zur Reinhaltung der Luft - http://de.wikipedia.org/wiki/Technische_Anleitung_zur_Reinhaltung_der_Luft and http://www.umweltbundesamt.de/luft/messeinrichtungen/TALuft_020724.pdf (TA Luft in English:	Precaution principle means to avoid and to reduce emission by

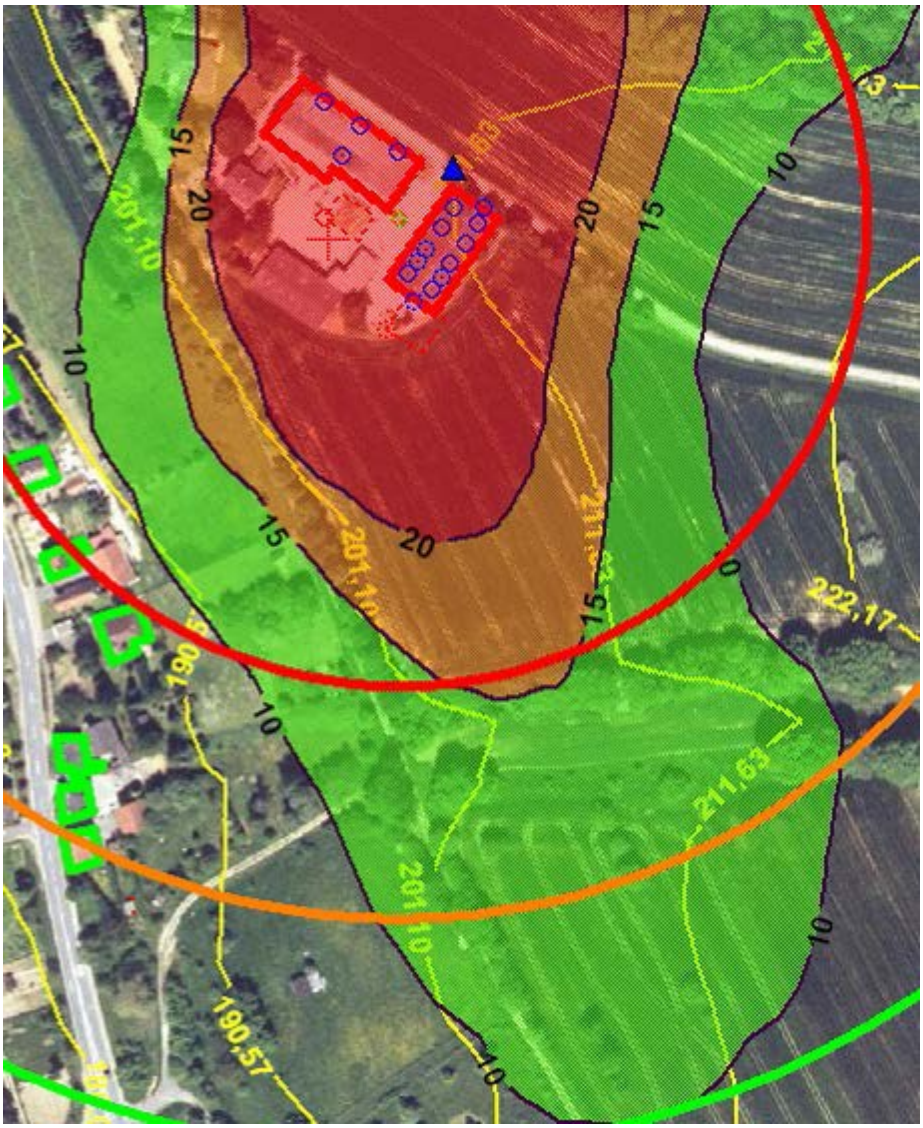
principle" and a "protection principle" according the above, meaning that the provisions of the guideline "TA Luft" must be observed.	http://www.bmu.de/fileadmin/bmu-import/files/pdfs/allgemein/application/pdf/taluft_engl.pdf)	measures according to the state of the art (BAT) Protection principle means that environmental effects caused by an installation must not exceed certain limit values
Emissions under field spreading is not regulated under BImSchG, but by the Düngeverordnung which is the transposition of the EU-Nitrates Directive into German law, but the environmental permit require the Düngeverordnung can be complied with	Düngeverordnung - http://www.gesetze-im-internet.de/bundesrecht/d_v/gesamt.pdf (In English: http://www.bmelv.de/SharedDocs/Rechtsgrundlagen/EN/F/Fertilisation-Act.html)	DÜV is applied over the whole area of Germany
TA Luft (Technische Anleitung zur Reinhaltung der Luft – TA Luft) deals in relation to livestock farming with the rediuction of emissions	TA Luft	If the simple calculation of distance requirements cannot be met, there shall be made a special assessment

and the assessment and reduction of immissions of ammonia, odour and dust. **It defines for a number of pollutants the limits for good air quality, whereof for ammonia, odour and dust.** **It holds tables with coefficients for livestocks' emissions with ammonia and odour, all indicated per animal place; for dust the VDI guideline 3894 is applied.** **TA Luft provides the background information to decide the necessary distance from a livestock house to neighbours.** **TA Luft also defines methods for measuring the air quality.**	• Ammonia – section 5.2.4 • Geruchsemissionsrichtlinien are established on Bundesländer level, not part of the present TA Luft • Dust – section 5.2.1 • Ammonia emission coefficients (kg/(AP a))– annex 1, table 11 • Odour emission coefficients, dependent on livestock units (LU) – section 5.4.7.1, table 10, and VDI Richtlinien Table 22 (http://www.vdi.de/uploads/tx_vdirili/pdf/1802148.pdf - only part of the guideline is available through this link) and odour emission factors given in OU/(LU s) • Dust (kg/(AP a)) – VDI Richtlinien • Odour emissions – Section 5.4.7.1 • Ammonia immissions – Appendix 1, figure 4. • Appendix 6.	by use of a dispersion model. Dust is calculated as total dust (emission reduction) and as PM10 in the case of assessment of environmental impacts.
The TA Luft dispersion model is used	Geruchsimmissions-Richtlinie (Guideline on Detection and Assessment of Odour in Ambient Air - http://www.lanuv.nrw.de/luft/gerueche/bewertung.htm#1)	Assessment limit values e.g.:

for estimating of distances to neighbours concerning odour, ammonia/N-deposition and dust/PM10, in case the general distances cannot be met (see example below).		forest: below 3 µg is irrelevant, 3 - 10 µg/m3 NH3 needs comparison to background, above 10 µg needs intensive investigation; 5 kg/(ha year) N-deposition limit for national habitats, Habitats Directive: 0.15 – 0.6 kg/(ha year)



Determination of general distance lines according TA Luft (Example provided by E. Grimm, KTBL).



EXAMPLE OF GIRL ESTIMATED ODOUR IMPACT OF PLANNED LIVESTOCK HOUSING, SHOWING THAT ALTHOUGH LOCATED WITHIN THE GENERAL DISTANCE LINES, THE ODOUR WILL NOT AFFECT NEIGHBOURS (EXAMPLE PROVIDED BY E. GRIMM, KTBL).

TA Luft will be changed according the final BREF. This means that the AEL (Associated Emission Levels) from the BREF will be included.

The environmental permit is given on basis of the types and number of animal places, and the housing systems used. The emissions that are calculated are also mentioned. Farms can't change neither animal places, housing system nor other without a new environmental permit.

Defined housing systems are developed by different universities.

The German livestock emission regulations include also bio-aerosols.

V.3: Technologies to measure emissions

The technologies are defined in the VERA protocols, but are too expensive for use in practical farming, and they require maintenance, cleaning and calibration.

V.4: Enforcement

There are four types of environmental approvals:

- Farms with a smaller number of livestock must notify their operations to regional building inspections (Kreisbauämter), and are controlled by the regional environmental authorities (LLUR in Schleswig-Holstein) in case they have a high livestock density, and by the local building administrations in case they have a low livestock density (there can be deviations from Länder to Länder).
- Farms with a higher number of livestock are required to have environmental permits, which for those with the highest number of livestock, the "IPPC-farms", is based on the formal procedures with public hearing. Environmental permit applications as well as the control activities are handled by the environmental authorities in the Bundesländer (for Schleswig-Holstein by LLUR).

Important parts of the physical inspection of livestock farms are to check if the number of livestock and the type of housing complies with the environmental permit.

V.5: Key institutions in implementing emission based regulations

V.5.1: Ministry of Environment / Federal Environmental Agency

The Ministry has the overall responsibility for implementation of emission-based regulations, and has established a working group of federal states on air pollution control to coordinate this on federal level.

http://www.umweltbundesamt.de/.

V.5.2: Landesamt für Landwirtschaft, Umwelt und ländliche Räume (LLUR), Schleswig-Holstein

The State Agency for Agriculture, Environment and Rural Areas (LLUR) has 8 departments dealing with agriculture, fisheries, nature conservation, water management, geology and soil management, technical environmental protection and the development of rural areas.

In relation to livestock emissions, LLUR appraise environmental permit applications and performs control of farms, including physical inspections of the farms.

As mentioned above, LLUR also has the responsibility for establishing and enforcement of Geruchsemissionsrichtlinien (odour emission guidelines) in Schleswig-Holstein.

http://www.schleswig-holstein.de/LLUR/DE/LLUR_node.html.

The institutional setup might differ in other Bundesländer.

V.5.3: Association for Technology and Structures in Agriculture (KTBL)

The Association for Technology and Structures in Agriculture (KTBL) is a registered association to which belong about 400 members. KTBL is promoted by the German Federal Ministry of Food, Agriculture and Consumer Protection. The headquarters resides in Darmstadt, where a staff of approx. 60 persons, whereof about 40 academic staff, supports various areas of activity. KTBL coordinate about 50 work groups, with 8-12 honorary volunteered experts. The mandated mission of KTBL is technology transfer.

In relation to emissions from livestock farms, KTBL participates as German representative in the Technical Working Group concerning BATS and BREF (the Sevilla process), it is appointed to assist the Ministry in the abovementioned federal coordination group on emissions, and has participated in the development of the housing systems descriptions (VDI Richtlinien).

http://www.ktbl.de.

V.5.4: Deutsche Landwirtschafts Gesellschaft (DLG)

DLG is among many activities undertaking tests of various products and farming equipment, and their test labels are widely acknowledged, also internationally.

DLG is on this background the German coordinator for the VERA cooperation, originally established in cooperation between environmental authorities in Denmark, Germany and the Netherlands. DLG is taking over the responsibility for the secretariat of VERA for a 4-years period starting 1 January 2014.

DLG holds a list of certified agro-environmental technologies at http://www.dlg.org/gebaeude.html, and an example of a tested air cleaning technology is http://www.dlg-test.de/pbdocs/5955.pdf.

V.6: List of people met

- Martin Kunisch, m.kunisch@ktbl.de, KTBL
- Ewald Grimm, e.grimm@ktbl.de, KTBL
- Dagmar Göbel, Dagmar.Goebel@llur.landsh.de, LLUR
- Uwe Rammert, Uwe.Rammert@llur.landsh.de, LLUR

Bilag VI: Information about emission regulation of Dutch livestock farming

This section is written in English language and confirmed by the Dutch expert listed below.

VI.1: The Dutch context

The Netherlands came out as a clear number one country in the initial search for reference countries to seek experience about livestock emission regulations from. The reason for this is that the Netherlands reported that they already take emissions of ammonia and odour into account in their regulation of livestock farming, and also because of a (very) high density of people and livestock in the country.

The Netherlands covers an area of 41,526 km2, similar to the area of Denmark, but the Dutch population counts 16.4 million people, and the livestock density is 3.3 LSU[14]/ha agricultural land, compared to Denmark's 5.6 million people and 1.7 LSU/ha.

Due to the high density of industry and transport etc. there is a relatively high background concentration of dust, and the high livestock production raises this further. Dust is produced in relatively large amounts from poultry farms, whether producing eggs or chicken meat. In the Netherlands, regulations are made for PM10, i.e. dust/particulate matter < 10 micro metre size. It is according EU's Air Quality Directive (2008/50/EC)[15] requested to set norms for both PM10 and PM2.5.

VI.2: Key-provisions in Dutch legislation

The key provisions dealing with emissions and livestock farming in the Netherlands is listed in the following, with reference to the legal document in question as well as possible comments:

Decision	Legal document reference	Comments
Only the so-called "IPPC farms"[16] need an environmental approval, whereas smaller and other types of livestock farms are requested to notify their production in	The Environmental Management Act - http://tinyurl.com/ou8nohq and its subordinate cabinet regulations.	The decision that farms under the "IPPC-thresholds" do not need an environmental permit like in several other countries, is made in order to reduce the costs and administrative loads in the public administration,

[14] Livestock Units – se definition på http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Livestock_unit_(LSU)
[15] http://ec.europa.eu/environment/air/quality/legislation/directive.htm
[16] Meaning those defined in the Industrial Emission Directive 2010/75/EU (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:334:0017:0119:en:PDF), annex I, 6.6.

number of animals and their housing system type to the local government.		and to simplify the regulation, wherever possible.
Limiting emissions of ammonia, dust and odour is a binding rule all livestock farms must observe. The environmental permits are not conditioned certain quantified emission quotas or air quality concentrations.	As above	This means, that also farms without an environmental permit, i.e. those who alone notified their production, have to ensure they do not emit more than allowed.
To calculate the ammonia emissions of a livestock farm, the number of animals permitted to be present on the livestock farm is multiplied by the emission factors.	Ammonia and Livestock farming Act, § 2.	
Maximally allowed ammonia emissions, for instance 1.4 kg per animal place per year for pigs from 25 kg to 7 months	Decision on livestock housing - http://tinyurl.com/p6sxalu	
Coefficient factors for ammonia emission from different livestock types in different livestock housing types	Ammonia and Livestock Regulation - http://tinyurl.com/njgqstb	For instance for slaughter pigs from 25 kg to 7 months the emission factor is 3.0 kg per year per place (code D 3.3.2) for other housing systems, which is the baseline, i.e. housing systems where no technologies to reduce the ammonia emission is installed.
In case, for instance, the housing system BWL 2008.01.V1 is used, which means that a biological aircleaner is installed and the animal density in the house is maximally 0.8 animal per m², then the ammonia emission coefficient is 0.8 kg/pig place/year.	BWL 2008.01.V1 - http://tinyurl.com/oqnxs7c	
Coefficients for odour are defined as for instance 23 OU per second per pig place from 25 kg to 7 months.	Regulation BWL2006333382 on odour and livestock production - http://tinyurl.com/oeaqln2	Like for ammonia, use of defined housing systems gives right to calculate with reduced odour emission factors.

No regulation exists concerning GHG from livestock farming.

For poultry there are plans soon to introduce limit values for dust, based on BAT's.

VI.3: Technologies to measure emissions

Technologies to measure emissions are used on research level, but are not economically feasible for monitoring of emissions from livestock farms.

VI.4: Enforcement

You can only get an environmental approval if the emissions are under the limit values. Emissions are calculated in the permitting process.

A dispersion models is used for calculation of nitrogen depositions from ammonia, and a similar for odour and dust. The models have some similarities, but there are different input parameters. The dispersion models are different from country to country due to differences in for instance topography (depositions are dispersed different in flat and mountainous countries).

In relation to ammonia, BAT's must be applied that brings the emission below the maximally allowed emission values according the Decree on ammonia emission from livestock houses, and similar for dust and odour.

The following example clarifies, how the enforcement is working:

Example with odour: 5,000 pigs from 25 kg to 7 months (incl. gilts and young sows).

The odour emission baseline (other housing systems) is 23 OU per pig place = 115,000 OU (1 OU is when people can smell it. The unit is per second.).

The dispersion model V. STACKS calculates the immission (effects on surrounding houses etc.) - the model (V stands for livestock production - veehouderij) converts the absolute figure to a concentration in the surroundings, also taking for instance a weather condition like prevailing wind direction into account.

3 OU/m^3 is the upper limit value. 2 % of the time of the year it is allowed to exceed the limit value.

V.STACKS is found in two versions, one for the 1-to-1 situation, where a farm wish to expand or build new, and needs to comply with the legislation, and another for accumulation, where other nearby farms are taken into consideration as well.

In this accumulation system other farms are taken into consideration, and if the pressure is too high in a locality, the permit limit values are reduced, for instance from 3 to 1 OU, in coming years permits given in that locality. This practice is alone applying to odour.

If the farm uses an air scrubber, which reduces the odour with 70%, he only produces about 34,500 OU/sec.

It is controlled by the local government every year that the air scrubber has the right dimension /capacity, and that it is maintained and used correctly.

The housing systems descriptions are used as checklists in case of physical farm inspections. If not

compliant, the farm is given a notice and has some time to make corrective actions. If this is not done, the production site is eventually closed, unless fines and court process have made the farmer correct the situation. The farm can also propose to reduce the production if the solution for renovating the housing system is not feasible.

The control authorities Herd and Animal Register information to check the number of animals. Dienstregelingen (an agency under Ministry of Economic Affairs - http://www.drloket.nl/) keeps the register.

The environmental permit says 5,000 pigs and specifies the housing system, but does not mention the quantified emissions, neither in absolute terms nor as concentrations.

Each farm needs furthermore animal rights to make a production. The animal rights are rights to produce manure from the concerned livestock, and therefore an environmental unit. There are in this case needed 5,000 pig rights. The rights are tradeable, and shall ensure, that the livestock production will not expand on a whole in the Netherlands.

If the farm uses stronger emission reducing technology than required, then it can ask for permission to expand the production, which requires a new permit. Typically a permit process takes ½ year.

The smaller non-IPPC farms have notified their number of animals and housing system to the authorities, after which the physical farm inspections are performed. In connection with the inspection is often made calculations to check whether the emission limits are exceeded, in which case the farm needs to ask for a permit. Livestock farms are inspected when they build the stable, and every three years.

VI.5: Key institutions in implementing emission based regulations

VI.5.1: Ministry of Infrastructure and the Environment (MI&E)

In general the Ministry is responsible for implementation of environmental legislation in the Netherlands, whereof that concerning livestock based emissions.

The Ministry's subordinate, the Directorate-General for the Environment and International Affairs (DGMI) is working on a healthy and safe living environment, taking account of the impact the Netherlands has on environmental problems in other countries.

The DGMI has in this connection more direct responsibility for enforcement of legislation concerning livestock emissions. It has for instance established a technical advisory group on emissions to assist the Ministry of Infrastructure and the Environment on implementation of the legislation.

http://www.government.nl/ministries/ienm.

VI.5.2: Wageningen UR Livestock Research (WUR)

Wageningen University is a widely acknowledged university, dealing with agriculture and food life sciences.

The WUR is appointed to represent the Netherlands in EU's Technical Working Group concerning installations for rearing of intensive livestock, related with the IED Directive. It also participates in the abovementioned technical advisory group under MI&E.

Furthermore, the descriptions of low emission housing systems are done by WUR, often in cooperation with companies offering the technologies, and recommended to the Government through the technical advisory group. The emission factors similarly. WUR often advise the inspectors, whether observations at farms are important or not.

http://www.wageningenur.nl/.

VI.5.3: South-East Brabant Region / Local governments

The Netherlands is divided in 11 provinces, with each a number of regions that again holds a variable number of local governments (comparable to municipalities in Denmark).

It is the local governments' responsibility to issue environmental permits to livestock farms, and to control them.

Fred Stouthard, one of the met experts, is situated in the South-East Brabant Region part, also unofficially called the Region of Eindhoven. There are 21 local governments in South-East Brabant Region, cooperating about their responsibility for environmental permitting and control of livestock farms in the unit "Omgevingsdienst Zuidoost-Brabant". The unit is staffed with 25 people, of who 10 deals with permitting, and 15 with farm inspections.

http://www.odzob.nl.

VI.6: List of people met

- Peter B. Bokelaar, Peter.Bokelaar@minienm.nl, Ministry of Infrastructure and the Environment
- Fred Stouthart, f.stouthart@odzob.nl, Omgevingsdienst Zuidoost-Brabant
- N. W. M. Ogink, nico.ogink@wur.nl, Wageningen UR
- H. H. Ellen, hilko.ellen@wur.nl, Wageningen UR

Udenlandske erfaringer med emissionsbaseret regulering af husdyrbrug
Referencelandene Holland, Belgien (den Flamske del) og Tyskland, som allerede i årevis har fokuseret på emissioner i deres regulering af husdyrbrug, har en lovgivning og administration, der på væsentlige punkter er sammenlignelig med den danske. De har ikke indført kvoter for emissionerne, og derved heller ikke kvoter som husdyrbrugeren frit kan forvalte, fx ved at fordoble produktionen samtidig med en halvering af emissionerne per dyr ved hjælp af miljøteknologi. Dette skyldes formentlig, at det for nuværende er teknisk og økonomisk urealistisk at monitere emissioner fra husdyr, men også at miljøgodkendelser jf. Direktivet for Industrielle Emissioner (2010/75/EU), fx også drejer sig om støj, energiforbrug og affaldshåndtering.

Mens ovenstående i sig selv er en væsentlig erfaring, vi kan drage nytte af, er der i referencelandenes regulering af emissioner en række elementer, vi kan lade os inspirere af.

Referencelandenes regulering af emissioner baserer sig på antal husdyrpladser i staldene, og de har fastsat emissionsfaktorer og grænseværdier for de typer af emissioner, som ønskes reguleret, og spredningsmodeller anvendes til vurdering af afstandskrav.

Miljøministeriet
Miljøstyrelsen

Strandgade 29
1401 København K
Tlf.: (+45) 72 54 40 00

www. mst.dk