



European Union Network for the Implementation
and Enforcement of Environmental Law

NATURE PROTECTION IN PERMITTING AND INSPECTION OF INDUSTRIAL INSTALLATIONS – IMPLEMENTATION OF ART. 6(3) OF THE HABITATS DIRECTIVE (PHASE 3)

Development of an IMPEL Guidance Document

PIG AND POULTRY FARMS AND NATURA 2000

And

Updated wind energy development case studies

Date of draft report: March 2017

Report number: 2015/14

Introduction to IMPEL

The European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL) is an international non-profit association of the environmental authorities of the EU Member States, acceding and candidate countries of the European Union and EEA countries. The association is registered in Belgium and its legal seat is in Brussels, Belgium.

IMPEL was set up in 1992 as an informal Network of European regulators and authorities concerned with the implementation and enforcement of environmental law. The Network's objective is to create the necessary impetus in the European Community to make progress on ensuring a more effective application of environmental legislation. The core of the IMPEL activities concerns awareness raising, capacity building and exchange of information and experiences on implementation, enforcement and international enforcement collaboration as well as promoting and supporting the practicability and enforceability of European environmental legislation.

During the previous years IMPEL has developed into a considerable, widely known organisation, being mentioned in a number of EU legislative and policy documents, e.g. the 7th Environment Action Programme and the Recommendation on Minimum Criteria for Environmental Inspections.

The expertise and experience of the participants within IMPEL make the network uniquely qualified to work on both technical and regulatory aspects of EU environmental legislation.

Information on the IMPEL Network is also available through its website at: www.impel.eu

<p>Title of the report:</p> <p>Nature protection in permitting and inspection of industrial installations – Implementation of Art. 6(3) of the Habitats Directive (phase 3)</p> <p><i>Development of an IMPEL Guidance Document PIG AND POULTRY FARMS AND NATURA 2000 and Updated wind energy development case studies</i></p>	<p>Number report:</p> <p>2015/14</p>
<p>Project Manager/Authors:</p> <p>Gisela Holzgraefe (DE), Project manager</p> <p>Iñaki Bergaretxe Urdampilleta (ES)</p> <p>Kate Bayley (UK)</p> <p>Andreja Slapnik (SI)</p> <p>Ana Garcia (PT)</p>	<p>Report adopted at IMPEL General Assembly Meeting:</p> <p>Date and location</p> <hr/> <p>Total number of pages: xx</p> <p>Report: 18</p> <p>Annex 1: Guidance 127</p> <p>Annex 2: Case studies: 34</p>
<p>Executive Summary</p> <p>In 2015 IMPEL carried out a follow-up project in the series of projects on “Nature protection in permitting and inspection of industrial installations Implementation of Art. 6(3) of the Habitats Directive”. The main tasks consisted of:</p> <ul style="list-style-type: none"> a. the Development of an IMPEL Guidance Document Pig and Poultry Farms and Natura 2000, b. the collection of updated wind energy development case studies and Natura 2000 and c. the collection of recommendations for important updates regarding wind energy and Natura 2000 (to be directly submitted to the Commission). <p>The IMPEL Guidance Document “Pig and Poultry Farms and Natura 2000” provides advice to permit authorities, nature conservation authorities and all those who are involved in the Article 6 (3) procedure of the Habitats Directive.</p> <p>For those who are not familiar with the Article 6 (3) procedure it gives an overview on the legal background with brief information on relevant EU legislation. Then it concentrates on sector specific aspects:</p> <ul style="list-style-type: none"> - definition of the boundaries and thresholds for livestock projects and cumulative effects, 	

- identified impacts of intensive farming projects on Natura 2000 sites, identified threats and pressures on Natura 2000 sites from intensive rearing of poultry and pigs
- Methodologies for the assessment of nitrogen deposition
- Information on documents and data to be submitted to the permit authority
- Some examples on criteria for determining significant effects
- information about screening and assessment tools in practice
- some considerations concerning permit conditions.

In order to ensure that the operators comply with their permits and that emissions, namely ammonia and other pollutants are reduced competent authorities must undertake regular inspections of intensive farms. The control can be done by (1) carrying out inspections (including site visits) at the farms and (2) undertaking visits to relevant Natura 2000 sites.

The scope of the chapter on inspections constitutes an approach to environmental inspections to pig and poultry farms, exploring only some specific impacts on nature and biodiversity considered in permit conditions, concerning item (1), ensuring compliance with permit conditions. For item (2) “undertaking site visits to relevant Natura 2000 locations” the project team proposes future IMPEL Projects on this subject, namely considering the need for Inspectors to ask for advice of the nature conservation body, to understand the conditions of the Natura 2000 and the impacts causing pressure on the site and how those impacts can be managed through inspection to a specific location/activity (of pigs and poultry) but also through a broader inspection of the Natura 2000 site where these activities take place

Fostering close cooperation between IED permitting and inspection authorities and nature conservation authorities allow for producing good and harmonised results.

The collection of **updated wind energy development case studies** and Natura 2000 provides some best practice examples of dealing with wind energy projects and Natura 2000. On top it informs about screening tools that are used in participating countries.

Disclaimer

This report is the result of a project within the IMPEL network. The content does not necessarily represent the view of the national administrations or the Commission.

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1. Introduction

1.1. Project background

The alarming decline in Europe's biodiversity as driven the adoption, by EU Member States of two key pieces of EU legislation – the Habitats and Birds Directives – to conserve Europe's most valuable species and habitats across their entire natural range within the EU.

The Birds and Habitats Directives are central to achieving the EU 2020 target of halting and reversing the loss of biodiversity endorsed by Heads of State and Government. The Commission has adopted an ambitious strategy to achieve this objective, comprised of six targets. Target 1 of this Strategy is focused on "Full implementation of EU nature legislation to protect" biodiversity and requires a significant improvement in conservation status. The implementation of EU nature legislation also contributes significantly to other targets of the biodiversity strategy, including in relation to green infrastructure and restoration under Target 2.

The "Study on Evaluating and Improving the Article 6.3 Permit Procedure for Natura 2000 Sites" of the Commission found out that in total the Article 6.3 permit procedures is functioning well. However, a number of current problems are mentioned in the study. Only nature authorities were involved in the study.

As a contribution for overcoming the problems, IMPEL carried out 2014 project with the title "Nature protection in permitting and inspection of industrial installations Implementation of Art. 6(3) of the Habitats Directive" in which nature authorities and permit and inspection authorities for industrial installations participated. It was found out very quickly that the project could only give a general overview of the situation and collect information about some best practice examples. It is impossible to give one receipt for all different species and particular targeted features. The project team recommended a step by step approach and to work on sector specific items. The team made a proposal for a new project consisting of the parts:

- The development of an IMPEL Guidance Document PIG AND POULTRY FARMS AND NATURA 2000 (Annex II to this report),
- Updated wind energy development case studies and Natura 2000 (Annex III to this report) and
- Important updates regarding wind energy developments and Natura 2000 (directly submitted to the Commission)

1.2. Project objectives

This project aimed at the exchange of experience concerning the wind energy sector and Natura 2000 in permitting and inspection of wind energy projects. As there is a rather fast development in the sector (micro turbines and growing height of the wind mills) as well as in the assessment of the impacts on different species, it was decided to collect best practice examples and make them available. From this work the project team collected some recommendations for updates regarding wind energy and Natura 2000. They were directly submitted to the Commission.

1.3. Methodology

After an in depth discussion of the items in the first project team meeting (28 – 29 May 2015 in Berlin) it was decided to collect best practice examples on dealing with the Habitats Directive in permitting and monitoring of wind energy projects. Another aim was to find out more about instruments, methods and supporting tools that are used in practice in the IMPEL member states. In this field the Guidance Document of the European Commission provides valuable information.

For the sector of husbandry it was decided to concentrate first on intensive rearing of poultry and pigs. For other kinds of animals and small animal numbers a follow-up project might be an option.

For collecting more information a workshop was carried out (24 – 26 August 2015 in Berlin).

The draft documents for both sectors – wind energy projects as well as pig and poultry farms and Natura 2000 were discussed and improved during the second project team meeting (22 – 23 October 2015 in Santiago de Compostela).

1.4. Participants

Members of the project team: Gisela Holzgraefe (DE), Project manager, Iñaki Bergareche Urdampilleta (ES), Andreja Slapnik (SI), Ana Garcia (PT), Kate Bayley (UK).

Participants of the workshop: Gisela Holzgraefe (DE), Deirdre French (IE), Katica Bezuh (HR), Iñaki Bergareche Urdampilleta (ES), Kate Bayley (UK), Constantin Hutupas (RO), Kirsten Schoonaert (BE), Lora Dimitrova (BG), Aleksandrina Yaprakova (BG), Mirjam E.A. Broekmeyer (NL), Maria Ines Trigo (PT), José Paulo Santos (PT), Iñaki Bergareche Urdampilleta (ES), Andreja Slapnik (SI), Ana Garcia (PT),

2. The products

2.1. IMPEL Guidance Document PIG AND POULTRY FARMS AND NATURA 2000

The IMPEL guidance document “Pig and poultry farms and Natura 2000” provides

- a) an overview on the legal background relevant for farm projects. This includes the Habitats Directive, the Environmental Impact Assessment and the Strategic Environmental Impact Directive, the Directive on Industrial Emissions, the Nitrates Directive and the National Emissions Ceilings Directive.
- b) The importance of strategic planning
- c) Information about the definition of the boundaries and thresholds for livestock projects and cumulative effects

- d) Identified impacts of intensive farming projects on Natura 2000 sites, identified threats and pressures on Natura 2000 sites from intensive rearing of poultry and pigs
- e) Methodologies for the assessment of nitrogen deposition
- f) Information on documents and data to be submitted to the permit authority
- g) Some examples on criteria for determining significant effects
- h) information about screening and assessment tools in practice
- i) some considerations concerning permit conditions
- j) information concerning inspection of farm projects.

Concerning Inspections the guidance concentrates on the farms, to ensure compliance with their permits. The ability to manage and reduce harmful emissions and subsequently protect biodiversity can be done by (1) ensuring that permit conditions are complied with and (2) undertaking visits to relevant Natura 2000 sites. For item (2) “undertaking site visits to relevant Natura 2000 sites” the project team proposes future IMPEL projects on this subject.

2.2. Updated wind energy development case studies and Natura 2000

The project team created two documents concerning wind energy development and its impact. The document with the case studies was the result of the workshop, in which the participants provided some good examples of dealing with wind energy projects and Natura 2000. On top they informed about screening tools that are used in their countries.

2.3. Important updates regarding wind energy developments and Natura 2000 (directly submitted to the Commission)

In phase 2 of the project series on “Nature protection in permitting and inspection of industrial installations – Implementation of Art. 6(3) of the Habitats Directive” the Commission had asked IMPEL to give feedback on the use of the existing Guidance Documents. The project team collected some recommendations for a future update of the Guidance Document “Wind energy developments and Natura 2000” and submitted it directly to the Commission.

3. Main conclusions and proposals for future work

3.1 Main findings

There is a need for:

Improving knowledge about and use of EU guidance / awareness raising measures,
Initiating revision of existing or development of new EU guidance,
Sharing existing national guidance and scientific studies on different projects,
Exchange of knowledge about screening criteria and assessment methodologies, e.g accepted practices: use of Critical Loads (CL), criteria for habitat loss, new approaches.
Follow-up projects should concentrate on small steps.

3.2 Proposal for future work

For 2016 the proposal of a follow-up project was to explore other projects, namely quarries, by making an evaluation of the applicability of the EU Guidance Document “Non-Energy Mineral extraction and Natura 2000”, on the subject of quarries and to explore the practices of Member States on the application of Art 6(3) of the Habitats Directive concerning this sector.

After that at least one project on the item of “Nature protection in permitting and inspection of industrial installations – Implementation of Art. 6(3) of the Habitats Directive” should concentrate on inspections.

Annexes

[Annex I: Terms of References](#)

[Annex II: IMPEL Guidance Document PIG AND POULTRY FARMS AND NATURA 2000
\(separate document\)](#)

[Annex III: Updated wind energy development case studies and Natura 2000
\(separate document\)](#)

Annex I. Terms of Reference Project 2015/14

TOR Reference No.:	Author(s): Gisela Holzgraefe, Ana Garcia and Inaki Bergareche
Version: 1.0	Date: 11/09/2015

TERMS OF REFERENCE FOR WORK UNDER THE AUSPICES OF IMPEL

1. Work type and title

1.1 Identify which Expert Team this needs to go to for initial consideration	
Industry	<input type="checkbox"/>
Waste and TFS	<input type="checkbox"/>
Water and land	<input type="checkbox"/>
Nature protection	<input checked="" type="checkbox"/>
Cross-cutting – tools and approaches -	<input checked="" type="checkbox"/>
1.2 Type of work you need funding for	
Exchange visits	<input checked="" type="checkbox"/>
Peer reviews (e.g. IRI)	<input type="checkbox"/>
Conference	<input type="checkbox"/>
Development of tools/guidance	<input checked="" type="checkbox"/>
Comparison studies	<input type="checkbox"/>
Assessing legislation (checklist)	<input type="checkbox"/>
Other (please describe):	<input type="checkbox"/>
1.3 Full name of work (enough to fully describe what the work area is)	
Nature protection in permitting and inspection of extractive industry (quarries) – Implementation of Art. 6(3) of the Habitats Directive	
1.4 Abbreviated name of work or project	
Permitting under Art. 6(3) HD - quarries	

2. Outline business case (why this piece of work?)

2.1 Name the legislative driver(s) where they exist (name the Directive, Regulation, etc.)

Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive or HD)

2.2 Link to IMPEL MASP priority work areas

- | | |
|--|-------------------------------------|
| 1. Assist members to implement new legislation | <input type="checkbox"/> |
| 2. Build capacity in member organisations through the IMPEL Review Initiatives | <input type="checkbox"/> |
| 3. Work on 'problem areas' of implementation identified by IMPEL and the European Commission | <input checked="" type="checkbox"/> |

2.3 Why is this work needed? (background, motivations, aims, etc.)

The alarming decline in Europe's biodiversity as driven the adoption, by EU Member States of two key pieces of EU legislation – the Habitats and Birds Directives – to conserve Europe's most valuable species and habitats across their entire natural range within the EU.

The Birds and Habitats Directives are central to achieving the EU 2020 target of halting and reversing the loss of biodiversity endorsed by Heads of State and Government. The Commission has adopted an ambitious strategy to achieve this objective, comprised of six targets. Target 1 of this Strategy is focused on "Full implementation of EU nature legislation to protect" biodiversity and requires a significant improvement in conservation status.

The implementation of EU nature legislation also contributes significantly to other targets of the biodiversity strategy, including in relation to green infrastructure and restoration under Target 2.

Europe's manufacturing and construction industries are heavily dependent on the non-energy extractive industry for essential raw materials, including non-energy minerals, resources that are many times present on Natura 2000 sites, which highlights the a need to assure the compatibility of extractive industry with effects on wildlife and nature.

In 2012 - 2014 the "Study on Evaluating and Improving the Article 6.3 Permit Procedure for Natura 2000 Sites" was carried out for the Commission. Only nature authorities were involved in it. A big variety of different approaches have been applied in practice.

In total it was found that the Article 6.3 permit procedures is functioning well.

However, some countries/regions some countries reported that there is still an overall lack of understanding of, or willingness to accept, the Article 6.3 procedure amongst certain authorities and/or sectors. Several countries reported that there was still a real need to set up a more systematic and consistent framework for assessment, provide skills training and locally adapted guidance (including for instance checklists and pro forma forms) for both the project or plan proponents and the competent authorities

A number of current problems are mentioned in the study:

- Poor quality of the AA;
- Lack of skills/ knowledge /capacity in the Article 6.3 procedure;
- Poor inadequate knowledge base on which to assess impacts ;
- Problems during screening;
- Lack of assessment of cumulative effects ;
- Poor understanding of key concepts and legal terms;
- Lack of early dialogue;
- Ineffectiveness of AAs as regards plans.

This report makes several recommendations, to facilitate the implementation of the HD Directive, increase the level of understanding of how this is to be done in practice and discuss any particularly

complex or problematic cases, including:

- User-friendly up-to-date and practical guidance documents (eg practical 'how to' guide, with worked up examples of how to collect baseline information, assess impacts or cumulative effects, identify mitigation measures, ...).
 - Consider drawing up standardized, but non obligatory, checklists of what to include in an AA report.
 - Organise more systematic training courses (tailored to particular needs) and exchange platforms for competent authorities;
- Ensure there is a consistent and uniform framework in place for screening of all types of plans and projects;
- Provide a standardized format for preparing the screening application and to guide the developer/competent authority in terms of the minimum level of information that is required for the screening test (together with guidelines and explanations of how to complete them).

In 2013 IMPEL carried out a small project "Nature protection in permitting and inspection" where the project team explored the needs and requirements concerning nature protection in permitting and inspection of industrial installations. The need for more information was confirmed. Therefore IMPEL carried out a follow-up in 2014 project with the title "Nature protection in permitting and inspection of industrial installations Implementation of Art. 6(3) of the Habitats Directive" in which nature authorities and permit and inspection authorities for industrial installations participated. The project took conclusions and recommendations into consideration. In the 2014 project the core team collected information by using a questionnaire and carried out a workshop. It was found out very quickly that the project could only give a general overview of the situation and collect information about some best practice examples. It is impossible to give one receipt for all different species and particular targeted features. *The main findings of the project 2014 were:*

There is a need for:

Improving knowledge about and use of EU guidance / awareness raising measures,
Initiating revision of existing or development of new EU guidance,
Sharing existing national guidance and scientific studies on different projects,
Exchange of knowledge about screening criteria and assessment methodologies, e.g accepted practices: use of Critical Loads (CL), criteria for habitat loss, new approaches.
Follow-up projects should concentrate on small steps.

In 2015 the project is ongoing, and the products will be:

- An evaluation of the applicability of the Guidance Document "Wind energy developments and Natura 2000" and a
- Sector specific guidance document on Article 6(3) HD in permitting of farm projects (pigs and poultry) (or one other sector the project team agrees on) – (with at least definition of the project and project boundaries, development of a screening list, problem of salami slicing)

In 2016 the proposal of a follow-up project is to explore other projects, namely quarries, by making an evaluation of the applicability of the EU Guidance Document "Non-Energy Mineral extraction and Natura 2000", on the subject of quarries and to explore the practices of MS on application of Art 6(3) of the HD concerning this sector.

2.4 Desired outcome of the work (what do you want to achieve? What will be better /

done differently as a result of this project?)
<p>Exchange of experience concerning the applicability of the EU Guidance Document “Non-Energy Mineral extraction and Natura 2000” – on the subject o quarries and to explore and present the practices of MS on application of Art 6(3) of the HD concerning this sector.</p> <p>At the same time improving better knowledge about the document and discussion of national approaches. If necessary, the evaluation may provide input for the Member States and the Commission.</p> <p>For the development of a common understanding and sharing as well as spreading knowledge a report should be developed. The results will be available for all interested parties.</p>
2.5 Does this project link to any previous or current IMPEL projects? (state which projects and how they are related)
<p>2013: “Nature protection in permitting and inspection”</p> <p>2014: “Nature protection in permitting and inspection of industrial installations Implementation of Art. 6(3) of the Habitats Directive”</p> <p>2015: “Nature protection in permitting and inspection of industrial installations Implementation of Art. 6(3) of the Habitats Directive”</p>

3. Structure of the proposed activity

3.1 Describe the activities of the proposal (what are you going, to do and how?)
<p>Working with a core team for the preparation of the project activities, including a short questionnaire to send to MS.</p> <p>Sending of the questionnaire to MS.</p> <p>Invitation of experts concerning quarry projects for the evaluation of the Guidance Document “Non-Energy Mineral extraction and Natura 2000”.</p> <p>Discussion with experts concerning Article 6(3) HD in permitting of projects.</p> <p>Preparation of the documents.</p>
3.2 Describe the products of the proposal (what are you going to produce in terms of output / outcome?)
<p>Report that includes an evaluation of the applicability of the Guidance Document “Non-Energy Mineral extraction and Natura 2000” and that complements it, with atual practices and examples from MS, intended to cover:</p> <ul style="list-style-type: none"> - The non-energy extractive industry (neei) in the eu; - The eu’s policy framework and legislation for nature and biodiversity; - Potential impacts of non-energy extraction activities on nature and wildlife; - The importance of strategic planning; - Article 6.3: carrying out an appropriate assessment of neei plans and projects in accordance with the habitats directive; - Article 6.4: alternative solutions; - Some neei activities and their relations with the provisions of article 6.3 and 6.4 (Rehabilitation);

- Monitoring in the framework of Article 6.3 and 6.4 provisions;
- Inspection.

3.3 Describe the milestones of this proposal (how will you know if you are on track to complete the work on time?)

January 2015: identification of core team members
 February to May 2015: identification of contributors to the project
 March 2015: first core team meeting
 March/April 2015: send questionnaire to MS
 June 2015: workshop with experts
 August 2015: second core team meeting
 September 2015: draft final report for Cluster i
 November 2015: submission of the draft final report to GA

3.4 Risks (what are the potential risks for this project and what actions will be put in place to mitigate these?)

4. Organisation of the work

4.1 Lead (who will lead the work: name, organisation and country) – this must be confirmed prior to submission of the TOR to the General Assembly)

Gisela Holzgraefe (DE)

4.2 Project team (who will take part: name, organisation and country)

Gisela Holzgraefe (DE), Project manager, Iñaki Bergareche Urdampilleta (ES), Andreja Slapnik (SI), Ana Garcia (PT), Kate Bayley (UK)

4.3 Other IMPEL participants (name, organisation and country)

t.b.d

4.4. Other non-IMPEL participants (name, organisation and country)

e.g. ENCA, Habitats Committee, ORNIS Committee, JASPERS, Working group for Appropriate Assessment procedure.

5. High level budget projection of the proposal. In case this is a multi-year project, identify future requirements as much as possible

	Year 1 (exact)	Year 2	Year 3	Year 4
How much money do you require from IMPEL?	17 270 €			
How much money is to be co-financed	-			
Total budget	17 270 €			

6. Detailed event costs of the work for year 1

	Travel € (max €360 per return journey)	Hotel € (max €90 per night)	Catering € (max €25 per day)	Total costs €
<u>Event 1</u>				
First core team meeting,	6 x 360 € = 2 160 €	540 €	150 €	2 850 €
March 2015,				
Location t.b.d.				
6 participants				
2 days, 1 night				
<u>Event 2</u>				
workshop	18 x 360 € = 6 480 €	3 240 €	1 350 €	11 070 €
June 2015				
Location t.b.d.				
18 (6 core team plus 12 experts on quarries)				
3 days / 2 nights				
<u>Event 3</u>				
second core team meeting	2 160 €	540 €	150 €	2 850 €
August 2015				
Location t.b.d.				
6 participants				
2 days, 1 night or 2 nights				
<u>Event 4</u>				
<Type of event>				
<Data of event>				
<Location>				
<No. of participants>				
<No. of days/nights>				
<u>Total costs for all events</u>	10 800 €	4 320 €	1 650 €	16 770 €

7. Detailed other costs of the work for year 1

7.1 Are you using a consultant?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
7.2 What are the total costs for the consultant?	{ }
7.3 Who is paying for the consultant?	-
7.4. What will the consultant do?	Development of a draft for the final report, the evaluation document and the sector specific guidance document
7.5 Are there any additional costs?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Namely: 500 €
7.6 What are the additional costs for?	participation in cluster i meeting
7.7 Who is paying for the additional costs?	IMPEL
7.8. Are you seeking other funding sources?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Namely:
7.9 Do you need budget for communications around the project? If so, describe what type of activities and the related costs	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Namely:

8. Communication and follow-up (checklist)

	What	By when
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8.1 Indicate which communication materials will be developed throughout the project and when <i>(all to be sent to the communications officer at the IMPEL secretariat)</i>	TOR [✓] * Interim report [✓] * Project report [✓] * Progress report(s) [✓] Press releases News items for the website [✓] * News items for the e-newsletter [✓] Project abstract [✓] * IMPEL at a Glance [✓] Other, (give details):	<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	t.b.d.
8.2 Milestones / Scheduled meetings (for the website diary)	First core team meeting Workshop Second core team meeting		
8.3 Images for the IMPEL image bank	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
8.4 Indicate which materials will be translated and into which languages	t.b.d.		
8.5 Indicate if web-based tools will be developed and if hosting by IMPEL is required	t.b.d.		
8.6 Identify which groups/institutions will be targeted and how	COM, non-IMPEL participants, e.g. ENCA, Habitats Committee, ORNIS Committee, JASPERS, Working group for Appropriate Assessment procedure.		
8.7 Identify parallel developments / events by other organisations, where the project can be promoted			

[✓]) Templates are available and should be used. *) Obligatory

9. Remarks

Is there anything else you would like to add to the Terms of Reference that has not been covered above?

*In case of doubts or questions please contact the
IMPEL Secretariat.*

*Draft and final versions need to be sent to the
IMPEL Secretariat in word format, not in PDF.*

Thank you.



European Union Network for the Implementation
and Enforcement of Environmental Law

Nature protection in permitting and inspection of industrial installations – Implementation of Art. 6(3) of the Habitats Directive (phase 3)

PIG AND POULTRY FARMS AND NATURA 2000

(IMPEL Guidance Document)

Date of draft final report: 15 March 2017

Report number: 2015/14

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<p>Title of the report:</p> <p>Nature protection in permitting and inspection of industrial installations – Implementation of Art. 6(3) of the Habitats Directive (phase 2)</p> <p>PIG AND POULTRY FARMS AND NATURA 2000</p> <p>(IMPEL Guidance Document)</p>	<p>Number report:</p> <p>2015/14</p>
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<p>Executive Summary</p> <p>The main purpose of this guidance is to provide information on how best to ensure the consideration of pig and poultry farm impacts on Natura 2000 sites remains in line with the provisions of the Habitats Directive. It provides specific information related to the appropriate assessments made under Article 6(3) Habitats Directive for pig and poultry farm projects. This guidance also includes several practical and effective examples and tools, together with links to further information. Examples include the Dutch, German, English, Scottish, Danish, Portuguese, Flemish and Romanian experience and in particular approaches to nitrogen deposition arising from pig and poultry farms and the impacts on Natura 2000 sites.</p> <p>The document is intended to be used by competent authorities, permit writers, inspectors, nature protection agencies, sites managers, consultants, enforcement, experts and other practitioners involved in the planning, design, implementation or approval of pig and poultry farms plans or projects, as well as other interested parties such as local communities, non-governmental organisations and international bodies.</p>	
<p>Disclaimer</p> <p>This report is the result of a project within the IMPEL network. The content does not necessarily represent the view of the national administrations or the Commission.</p>	

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1 INTRODUCTION

1.1 BACKGROUND

At European Union (EU) level, nature and biodiversity are protected by several laws, including the Birds Directive (adopted in April 1979), which provides comprehensive protection to all wild bird species naturally occurring in the Union, and thirteen years later, the introduction of the Habitats Directive which protects 1000 animals and plant species and over 200 types of habitat. The Habitats Directive also established the EU-wide Natura 2000 network of protected areas. In 1999, the EU reinforced the role of zoos in the conservation of biodiversity and, in the wake of the EU Biodiversity Strategy to 2020, committed to protect native biodiversity and ecosystem services against invasive alien species. There is also legislation regulating certain aspects of wildlife trade (Nature and biodiversity law¹).

The EU Biodiversity Strategy aims to halt the loss of biodiversity, enhance ecosystem services in the EU and help stop global biodiversity loss by 2020. The main targets of the Strategy are the protection of species and habitats, maintaining and restoring of ecosystems, achieving more sustainable agriculture and forestry, making fishing more sustainable, and European seas healthier, and combating invasive alien species (Biodiversity strategy²).

According to the Article 6(3) of the 'Habitats Directive' 92/43/EEC, Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. The appropriate assessment of the impacts of a plan or project on the site, provided for in Article 6(3), enables the competent national authorities to arrive at conclusions regarding the consequences of the proposal in relation to the integrity of the site concerned. If these conclusions are positive, in the sense that no reasonable scientific doubt remains as to the absence of effects on the site, the competent authorities can give their consent on the plan or project. In case of doubt, or negative conclusions, the precautionary and preventive principles should be applied and procedures under Art. 6(4) followed. Furthermore, taking into account the precautionary principle and applying a preventive approach might also lead to the decision not to proceed with the plan or project (Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC, 2007/2012³).

¹ http://ec.europa.eu/environment/vnature/legislation/index_en.htm, 2.11.2016

² http://ec.europa.eu/environment/vnature/legislation/index_en.htm, 2.11.2016

³ http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/new_guidance_art6_4_en.pdf

PIG & POULTRY SECTOR

Pig and poultry farms are a significant contributor to emissions of pollutants to air and water, as is the spreading of manure, an activity that often accompanies the rearing of animals. These farms can affect the typical species and habitats through the generation of several pollutants such as:

- ammonia emissions,
- nutrients from manure, litter and slurry,
- effluent discharges,
- dust,
- odour,
- noise.

The Best Available Techniques Reference document (BREF document) “Intensive Rearing of Poultry or Pigs” (BREF, 2015)⁴, notes that until the early seventies, poultry and pig production comprised only part of the activities of a mixed farm, where crops were grown and different animal species were kept. Nowadays only a very small number of this type of farm still exist in the EU, and animal numbers and farm sizes have increased considerably. Worldwide, Europe is the second largest producer of hens eggs, making up approximately 10 % of the world total. Eggs for human consumption are produced in all Member States, however the largest producers are Spain, France, and Germany (BREF , 2015: 6). In 2012, the total poultry meat production across the 27 European Union member states (hereafter termed ‘EU-27’) was 12.9 million tonnes, which represents an increase on production of 14% compared to 2007 (BREF, 2015: 9). The seven leading producers of broiler meat, each with an annual production of more than 0.7 million tonnes are the UK, Poland, Germany, France, Spain, Italy and the Netherlands. These countries account for 76 % of the EU's poultry meat production (BREF, 2015: 9) According to data from December 2013 Germany, Spain, France, Denmark, Poland and the Netherlands are the major producers of pork at the EU level, housing more than two thirds of Europe’s breeding pigs (BREF, 2015: 20, 21).

Since rearing of pigs and poultry is an existing, and arguably, vital part of agriculture in all Member States these farms are often situated in or near to Natura 2000 sites. The Habitats Directive does not prohibit the operation of already existing farms or the building of new installations in or near to Natura 2000 sites and their areas of influence; however it does require an assessment of impacts from the proposal on the nature conservation site to be undertaken. The operation of both large regulated and smaller non-regulated farms can have negative effect on the conservation status of natural habitats and species of community interest. So far on the European level there is no guidance document that deals with the impacts of pig and poultry farms on Natura 2000 sites. This document aims to help populate this gap in knowledge.

⁴ http://eippcb.jrc.ec.europa.eu/reference/BREF/IRPP_Final_Draft_082015_bw.pdf ⁵ 255 species and 57 habitat types of community interest are closely associated with agriculture.

Farmland currently makes up approximately 40% of the total area included in Natura 2000 designations across Europe. Many of the habitats and species that are protected under the Habitats and Birds Directives are dependent on, or associated with, agricultural practices⁵. These habitats and species are now dependent on locally tailored extensive farming systems and practices for their continued survival. Yet in the last 50 years, through the combined effects of farm intensification and land abandonment, farmland biodiversity has undergone a dramatic decline (“Farming for Natura 2000 Guidance on how to support Natura 2000 farming systems to achieve conservation objectives, based on Member States good practice experiences” CE, 2014: i)⁶.

Extensive livestock management has become unprofitable in many agricultural regions resulting in either abandonment or intensification in the absence of financial support (Beaufoy and Marsden, 2010), which are the main drivers and pressures on Natura 2000 farmland. Extensive livestock systems where the forage areas are mainly semi-natural vegetation, including pastures, heath and scrub valuable landscape features can support a high species biodiversity.

1.2 PURPOSE OF THE GUIDANCE

The main purpose of this guidance is to provide information on how best to ensure the consideration of pig and poultry farm impacts on Natura 2000 sites remains in line with the provisions of the Habitats Directive.

Of considerable concern to the implementation of the Habitats Directive in Natura 2000 sites recognised in the IMPEL report “Building up IMPEL nature conservation capacities” (2013) is related to the appropriate assessments made under Article 6(3), which are often of poor quality. Typical issues that are inadequately addressed include assessment of cumulative impacts, analysis of the baseline condition, or drawing conclusions in conformity with the assessment results.

This guidance also includes several practical and effective examples and tools, together with links to further information. Examples include the Dutch, German, English, Scottish, Danish, Portuguese, Flemish and Romanian experience and in particular approaches to nitrogen deposition arising from pig and poultry farms.

The document has been developed by IMPEL and is intended to be used by competent authorities, inspectors, Nature Protection Agencies, Sites Managers, Consultants, Enforcement, Experts and other practitioners who are involved in the planning, design, implementation or approval of pig and poultry farms plans or projects, as well as other

⁵ 255 species and 57 habitat types of community interest are closely associated with agriculture.

⁶ Farming for Natura 2000 Guidance on how to support Natura 2000 farming systems to achieve conservation objectives, based on Member States good practice experiences”, CE, 2014, available at <http://ec.europa.eu/environment/nature/natura2000/management/docs/FARMING%20FOR%20NATURA%202000-final%20guidance.pdf>

interested parties such as local communities, non-governmental organisations (hereafter termed 'NGOs') and international bodies.

1.3 SCOPE OF THE GUIDANCE

This guidance is directed at pig and poultry farms and covers intensive farms of all sizes, not just Industrial Emissions Directive installations. It includes new and already existing installations whereby a change demands a new assessment of the impacts and to assess cumulative effects. Target farms are located in Natura 2000 sites but also nearby where their impact on Natura 2000 sites is still possible.

The focus of this guidance is on the implementation of Article 6 (3) and covers several topics:

- potential impacts of intensive farming on Natura 2000 sites and wildlife
- screening and screening criteria
- measures for avoidance (mitigation) of impacts that may cause significant effects
- permit conditions
- aspects of inspection

Manure treatment and spreading is not specifically covered in this guidance. During its development the inclusion of this activity was discussed. However, as in the participating countries the spreading of manure is part of the agricultural and/or water management legislation, the decision was to only consider aspects included in the permits at this time. Manure spreading being mainly an off-farm activity it is not routinely included in permits, with some exceptions as the obligation to elaborate an off-farm manure spreading plan, however here obligations are mostly on the off-farm plot owners. Other activities like operation of biogas plants are also excluded from the scope of this guidance.

In the future it may be possible to update this guidance with farms rearing other animals such as cattle, sheep, and goats etc.. It would also be desirable to include other important impacts that derive from this activity such as manure spreading and to explore practical examples, such as the application of cumulative effects. Spreading of manure under Industrial Emissions Directive, point 19 is considered as a significant contributor to emissions of pollutants into air and water, and there is a need to establish the most suitable controls of these emissions through the application of best available techniques and through other regulations, such as the Nitrates Directive.

2 LEGAL BACKGROUND

2.1 THE HABITATS DIRECTIVE

The Habitats Directive, Council Directive 92/43/EEC of May 1992 on the conservation of natural habitats and of wild fauna and flora, is, along with the Birds Directive, the cornerstone of the EU's nature conservation and biodiversity policy. The main aim of Habitats Directive is to promote the maintenance of biodiversity through the conservation of natural habitats and species of wild fauna and flora. The overall objective of the Birds Directive is the conservation of all species of naturally occurring birds in the wild state. The Habitats Directive protects approximately 230 rare and threatened habitat types, and approximately 1200 European species (the Directive includes mammals, reptiles, fish, crustaceans, insects, molluscs, bivalves and plants) other than birds.

2.1.1 PLANNING NEW DEVELOPMENTS THAT MIGHT AFFECT A NATURA 2000 SITE. ARTICLE 6 OF THE HABITATS DIRECTIVE

Paragraphs 6(3) and 6(4) of Habitats Directive lay down the procedure to be followed when planning new developments that might affect a Natura 2000 site.

PARAGRAPH 6(3) OF THE HABITATS DIRECTIVE

Paragraph 6(3) states: *Any plan or project likely to have a significant effect on a Natura 2000 site, either individually or in combination with other plans or projects, shall undergo an **appropriate assessment** to determine its implications for the site in view of the site's conservation objectives. The competent authorities can only agree to the plan or project after having ascertained that it will not adversely affect the integrity of the site concerned.*

A **screening** of the potential impacts of the project and their significance has to be carried out in the first stage of the procedure (equivalent to the screening stage of the environmental impact assessment procedure). If the screening results indicate the project or plan is likely to have a significant effect on a Natura 2000 site, either individually or in combination with other plans or projects, an **appropriate assessment** must be carried out.

Paragraph 6(3) of the Habitats Directive contains key terms that require clear definitions for carrying out an appropriate assessment:

Significant effect: This definition has also been addressed in the European Commission Guidance on Article 6 of the Habitats Directive, stating: *'The notion of what is 'significant' needs to be interpreted objectively. At the same time, the significance of effects should be determined in relation to the specific features and environmental conditions of the protected site concerned by the plan or project, taking particular account of the site's conservation objectives.'*⁷

Integrity of the site: It is clear from the context and from the purpose of the Habitats Directive that the 'integrity of the site' relates to the site's conservation objectives. The 'integrity of the site' has been usefully defined in the European Commission Guidance on Article 6 of the Habitats Directive as *'the coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified'* *'The integrity of the site involves its ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the site's conservation objectives'*.⁸

Favourable conservation status: The term conservation status is defined in the Habitats Directive (Article 1);

- For a natural habitat, conservation status means "the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species within the territory referred to in Article 2 (Article 1e).
- For a species, the conservation status means "the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within the territory referred to in Article 2 (Article 1i).

The conservation status of a natural habitat will be taken as 'favourable', following the definition of Article 1(e) of the Habitats Directive when:

- Its natural range and areas it covers within that range are stable or increasing, and
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- The conservation status of its typical species is favourable as defined below.

The conservation status of a species will be taken as 'favourable' when:

⁷ See section 4.4.1 of the EC Guidance document on the Article 6 of the Habitats Directive, available at http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision_of_art6_en.pdf

⁸ See section 4.6.3 of the of the EC Guidance document on the Article 6 of the Habitats Directive, available at http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision_of_art6_en.pdf

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- The natural range of the species is neither being reduced nor is likely to be reduced in the foreseeable future and
- There is, and will probably continue to be, sufficiently large habitat to maintain its populations on a long-term basis

Conservation objectives: indicates the need for establishing site-related conservation objectives as a necessary reference for identifying site-related conservation measures and for carrying out appropriate assessments of the implications of plans and projects for a site. As stated in the Commission note on setting conservation objectives for Natura 2000 sites (final version of 21/11/2012), *'A conservation objective is the specification of the overall target for the species and/or habitat types for which a site is designated in order for it to contribute to maintaining or reaching favourable conservation status of the habitats and species concerned, at the national, biogeographical or European level'*⁹. Conservation objectives are part of the Standard Data Form of the site. In the context of Habitats Directive, *'broad conservation objectives aiming at achieving favourable conservation status of habitats and species should be considered at an appropriate level, such as for example the national or the biogeographical level. This general objective needs however to be translated into site level conservation objective's'*¹⁰. When setting site-specific conservation objectives, it may be useful to consider the parameters that are used to assess the conservation status of habitats and species of EU interest as part of Article 17 of the Habitats Directive reporting process (see section 4.7.5 Threats and pressures on Natura 2000 sites from pig and poultry farms). The approach of the Habitats Directive Article 17 assessment report), such as the range, the area, structure and function for habitats; range and population for species. Some examples of attributes that may be considered in the definition of conservation objectives are presented below:

- Habitat area: The area occupied by the target habitats should be stable or increasing (overall target areas can be set).
- Habitat structure and function: The communities of target habitats should be stable in distribution and composition. Habitat functions and the ecological parameters on which the habitat persistence depends are maintained.
- Species abundance and distribution, population structure: Species populations are stable or increasing (target numbers can be set). Population trends are improving. Species distribution, including vital areas and connectivity, is maintained or improved (e.g. through habitat improvement and re-colonisation of improved areas). Population structure is conserved.

⁹ See question 2 of the Commission note available at http://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm

¹⁰ See question 2 of the Commission note available at http://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm

PARAGRAPH 6(4) OF THE HABITATS DIRECTIVE

In exceptional circumstances, a plan or project may still be allowed to go ahead, in spite of a negative assessment, provided there are no alternative solutions and for imperative reasons of overriding public interest (IROPI). In such cases the Member States must take appropriate compensatory measures to ensure that the overall coherence of the Natura 2000 Network is protected.

2.1.2. EUROPEAN COMMISSION GUIDANCE ON THE PROVISIONS OF ARTICLE 6 OF THE HABITATS DIRECTIVE

To assist in the understanding and correct application of the Article 6 of the Habitats Directive procedure, the Commission has produced a number of interpretative and methodological guidance documents on specific provisions of the Article¹¹. They include:

2.1.2.1 GENERAL GUIDANCE

- Managing Natura 2000 sites: The provisions of Article 6 of the Habitats Directive 92/43/EEC (2000).
- Assessment of plans and projects significantly affecting Natura 2000 sites (November 2001).
- Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC (updated on 7.12.2012).

2.1.2.2. - SECTOR SPECIFIC GUIDANCE

- Guidance on Natura 2000 and forests.
- Farming for Natura 2000.
- Guidance on Aquaculture and Natura 2000.
- Inland waterway transport and Natura 2000.
- The implementation of the Birds and Habitats Directives in estuaries and coastal zones.
- Integrating biodiversity and nature into port development.
- Wind energy developments and Natura 2000.
- Non-energy mineral extraction and Natura 2000.
- Guidance document on Climate change and Natura 2000.

¹¹ Available at http://ec.europa.eu/environment/nature/info/pubs/directives_en.htm.

2.2 THE BIRDS DIRECTIVE

The Birds Directive, Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version of the Council Directive 79/409/EEC on the conservation of wild birds, as amended) is, beside the Habitats Directive, the second cornerstone of the EU's nature conservation and biodiversity policy.

The main aim of Birds Directive is to promote the conservation of the species of wild birds naturally occurring in the European territory of Member States. The Directive covers more than 500 wild bird species. Being mainly migratory species, it was considered by the EU that they constitute a common heritage and that their protection was typically a trans-frontier environmental problem entailing common responsibility. The Birds Directive applies to birds, their eggs, nests and habitats (Article 1).

With that purpose, the Birds Directive provides the obligation for Member States to establish a general system of protection for all bird species covered by the Directive, including the prohibition of capturing, killing, deliberately disturbing and keeping of birds, the destruction or removal of eggs and nests. Exceptions are considered regarding the sale (Annex III) and hunting (Annex II) of certain species included in the Annexes mentioned (Articles 5, 6, 7, 8 and 9)

For the species included in Birds Directive Annex I (194 species), the Directive provides for the implementation of special conservation measures concerning bird habitats. With that aim, Member States may classify areas of land as special protection areas for birds (SPAs) (Article 4). The special protection areas for birds and the special areas for conservation (designated under the Habitats Directive) comprise the Natura 2000 network. Appropriate assessment as provided in Art. 6 of the Habitats Directive is required when any Natura 2000 site is concerned.

2.3 THE ENVIRONMENTAL IMPACT ASSESSMENT DIRECTIVE AND THE STRATEGIC ENVIRONMENTAL ASSESSMENT DIRECTIVE

2.3.1 THE ENVIRONMENTAL IMPACT ASSESSMENT DIRECTIVE

The Environmental Impact Assessment Directive (85/337/EEC) and its three amendments have been codified by Directive 2011/92/EU of 13 December 2011. Directive 2011/92/EU has been amended in 2014 by Directive 2014/52/EU. This Directive applies to a wide range of defined public and private projects, which are defined in Annexes I and II:

2.3.1.1 ANNEX I (MANDATORY EIA)

Annex I lists the types of projects considered to have significant effects on the environment. An environmental impact assessment (EIA) procedure is mandatory for them.

The EIA procedure can be summarised in the following steps:

1. Developer may request advice from the competent authority regarding the information them must supply to undertake an EIA (scoping stage)
2. Developer provides information on the environmental impact (EIA report – Annex IV);
3. Environmental authorities and the public (and affected Member States) must be informed and consulted;
4. Competent authority determines the project, taking into consideration the results of any consultations.
5. The public is informed of the decision afterwards and can challenge the decision before the courts.

2.3.1.2 ANNEX II (SCREENING)

In Annex II, categories and projects are listed for which the national authorities decide whether an Environmental Impact Assessment is needed. This is normally done by the "screening procedure", which determines the effects of projects on the basis of thresholds criteria or a case by case examination. However, the national authorities must take into account the criteria laid down in Annex III of the directive. The projects listed in Annex II are, in general, those not included in Annex I, but also other sector types such as industrial state and urban development projects, ski runs, flood-relief works, changes of Annex I and II existing projects.

2.3.2 THE STRATEGIC ENVIRONMENTAL ASSESSMENT DIRECTIVE (2001/42/EC)

The Strategic Environmental Assessment Directive (2001/42/EC) of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment, applies to a wide range of public plans and programmes (e.g. on land use, transport, energy, waste, agriculture, among others).

Plans and programmes with respect to the SEA Directive must be prepared or adopted by an authority (at national, regional or local level) and be required by legislative, regulatory or administrative provisions.

The Strategic Environmental Assessment Directive does not have a list of plans/programmes similar to the Environmental Impact Assessment Directive. An strategic environmental assessment is mandatory for plans/programmes which are:

- *prepared for agriculture, forestry, fisheries, energy, industry, transport, waste/ water management, telecommunications, tourism, town & country planning or land use and which set the framework for future development consent of projects listed in the EIA Directive.*

OR

- *have been determined to require an assessment under the Habitats Directive.*

The strategic environmental assessment procedure can be summarised in the following steps:

1. An environmental report is prepared in which the likely significant effects on the environment and the reasonable alternatives of the proposed plan or programme are identified.
2. The public and the environmental authorities are informed and consulted on the draft plan or programme and the environmental report prepared. The environmental report and the results of the consultations are taken into account before adoption.
3. Once the plan or programme is adopted, the environmental authorities and the public are informed and relevant information is made available to them.
4. In order to identify unforeseen adverse effects at an early stage, significant environmental effects of the plan or programme are to be monitored.

2.4 OTHER RELEVANT EU LEGISLATION

2.4.1. INSTALLATIONS COVERED BY THE DIRECTIVE ON INDUSTRIAL EMISSIONS DIRECTIVE

The Industrial Emissions Directive (2010/75/EU) lays down rules on integrated prevention and control of pollution arising from industrial activities. In order to prevent, reduce and as far as possible eliminate pollution arising from industrial activities in compliance with the 'polluter pays' principle and the principle of pollution prevention. It establishes a general framework for the control of the main industrial activities, giving priority to intervention at source. It also lays down rules to achieve a high level of protection for the environment as a whole.

Intensive rearing of poultry and pigs is included in the Annex I of the Industrial Emissions Directive. There is a specific reference to intensive rearing of poultry and cattle in this Directive (point 20) as a significant contributor to emissions of pollutants to air and water.

Best Available Techniques (BAT) are clearly defined in Article 3.10 of Industrial Emissions Directive and are listed within the BREF (2015). There are associated emission levels to BAT (BAT-AELs).

2.4.2 FRESHWATER POLICIES AND THE NITRATES DIRECTIVE

The Council Directive 91/676/EEC (Nitrates Directive) aims to protect water quality across Europe by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices, including the reduction and the limitation of the land application of the nitrogen contained in manure to a given amount per hectare each year (170 kg N). The Nitrates Directive is the primary legislation that relates to manure and requires the implementation of an action plan targeting manure, beside other issues. In this framework, Member States shall put various initiatives in place to address diffuse pollution from agriculture:

- Identification of water polluted, or at risk of pollution from nitrates
- Designation as "Nitrate Vulnerable Zones"(NVZs) of known areas of land which drain into polluted waters or waters at risk of pollution from nitrates (some member states have chosen to designate their whole territory as NVZ (Austria, Denmark, Finland, Germany, Ireland, Lithuania, Luxembourg , Malta, Netherlands and Sweden as well as the Regions of Flanders (Belgium) and Northern Ireland (United Kingdom))
- Establishment of Codes of Good Agricultural Practice to be implemented by farmers
- Establishment of action programmes of measures. Action programmes are mandatory for farmers within NVZ, though optional for farmers outside these zones

The Annex III of the Nitrates Directive lays down other measures that must also be included in the action programmes (for example limiting manure spreading to 170 kg N/ha/y), although derogations are applicable under certain circumstances.

The objectives of the Nitrates Directive are also taken into account in several other Directives linked to water, such as the Water Framework Directive (2000/60/EC), the Groundwater Directive (2006/118/EC) and the Drinking Water Directive (98/83/EC as amended). Farms contribute to increased levels of nitrates contamination of groundwater by their ammonia emissions and by spreading of manure.

2.4.3 THE GOTHENBURG PROTOCOL (1999) AND THE NATIONAL EMISSIONS CEILINGS DIRECTIVE (2009).

Aerial pollutants can travel over long distances and over national boundaries. In order to limit air pollution responsible for acidification, eutrophication and ground-level ozone pollution the European Union has policies in place limiting individual sources but also national totals of atmospheric emissions of four pollutants: sulphur dioxide (SO₂), nitrogen oxides (NO_x), volatile organic compounds (VOC) and ammonia (NH₃).

The National Emissions Ceilings Directive is part of the shift of EU policies to address the effects of air pollution on biodiversity. Critical loads for eutrophication and acidification are linked to impacts on biodiversity and this can be translated into policy. As defined in Article 3 of National Emissions Ceilings Directive 'critical load' means: *a quantitative estimate of an exposure to one or more pollutants below which significant adverse effects on specified sensitive elements of the environment do not occur, according to present knowledge.*

In order to reach the target of keeping emissions below these ceilings, Annex IX of the Gothenburg protocol deals specifically with pollution from agriculture with measures including:

- Defining good agricultural practice
- Livestock feeding strategies
- Low-emission animal housing systems
- Nitrogen budgeting (using input-output balances)

- Urea and ammonium carbonate fertilizers
- Manure application
- Manure storage
- Animal housing

On 3 May 2012, the Protocol was amended, including new emission ceilings for 2020 and new ceilings for fine particulate matter (PM 2.5).

The National Emissions Ceilings Directive is currently being reviewed as part of the Clean Air Policy Package. The proposal repeals and replaces the current Union regime on the annual capping of national emissions of air pollutants, as defined in Directive 2001/81/EC. By doing so, it ensures that the national emission ceilings (NECs) set in the current Directive 2001/81/EC for 2010 onwards for SO₂, NO_x, non-methane VOC (NMVOC) and NH₃ shall apply until 2020 and establishes new national emission reduction commitments ("reduction commitments") applicable from 2020 and 2030 for SO₂, NO_x, NMVOC, NH₃, PM_{2,5} and methane (CH₄).

3 DEFINITION OF THE BOUNDARIES AND THRESHOLDS FOR (LIVESTOCK) PROJECTS AND CUMULATIVE EFFECTS

3.1 DEFINITION AND BOUNDARIES OF A (LIVESTOCK) PROJECT

Under Article 6 (3) of Habitats Directive (HD) it is crucial to determine whether a project, such as a pig and poultry farm, can have significant effects on the conservation objectives of a Natura 2000 site and should be (or not) subject to an appropriate assessment, a process usually referred to as screening.

Defining legislative concepts for “project” as well as “installation” and in particular “livestock” are important themes to assure their boundaries include all the effects that must be evaluated. Table 3.1 details definitions for such concepts given on Industrial Emissions Directive (IED), Environmental Impact Assessment Directive (EIAD) but also some examples from Member State national legislation.

In Habitats Directive there is no stated definition of project, but a broad definition is proposed in the European Commission (EC) Guidance on Article 6 of the Habitats Directive ‘Managing Natura 2000 sites’ (EC, 2000: 30 - 3112, by analogy with the Environmental Impact Assessment Directive. It provides that a project is:

- the execution of construction works or of other installations or schemes
- other interventions in the natural surroundings and landscape including those involving the extraction of mineral resources, the construction and operation of industrial installations included in the Annex I of the Industrial Emissions Directive, as pig and poultry farms above the established thresholds, are therefore considered projects, but smaller industrial installations such as wind farms (not included in the Annex I of Industrial Emissions Directive) or small animal farms below the thresholds of Annex I are also considered to be projects in the sense of Habitats Directive. The decisive criterion is the probability of effects on a Natura 2000 site.

Also, Habitats Directive doesn’t provide a list of categories, activities or types of installations associated to the projects which shall undergo an appropriate assessment, as it is the case in the Industrial Emissions Directive or in Environmental Impact Assessment Directive, so therefore its requirements apply to pig and poultry farms under these two directives as well as to smaller projects.

¹² See section 4..3.1. of the EC Guidance document on the Article 6 of the Habitats Directive, available at http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision_of_art6_en.pdf,

As a consequence, all projects (including those related to industrial activities as well as to other activities such as agriculture, silviculture, aquaculture, tourism, infrastructures, building etc.) likely to have a significant effect on a Natura 2000 site shall be subjected to an appropriate assessment procedure. The EC Guidance (2000) clarifies that this definition is not limited to physical construction, also covering for example a significant intensification of agriculture which threatens to damage or destroy the semi-natural character of a site. In this context a project can be a new installation¹³ or a change (including extensions) in an existing installation¹⁴.

In Germany, the Federal Immission Control Act (§ 3 (5)), states that “Installation” shall mean: *any operating plants and other stationary facilities, any machines, equipment and other non-stationary technical facilities, any premises used to store or deposit or to carry out work likely to cause emissions (except routes),* (§ 1 (2)). Ordinance on Installations Subject to Licensing, complements this noting that the need for a permit shall cover all planned parts of installations or process stages which are required for the operation of the installation and auxiliary facilities associated with parts of installations and process stages which may be relevant to:

- The occurrence of harmful environmental impacts
- Precaution against harmful environmental impacts
- The occurrence of other risks, significant disadvantages or significant disturbances

The BREF (2015) for “Intensive Rearing of Poultry or Pigs” defines that for the purposes of this document, the term 'farm' is used as a synonym for 'installation', which may consist of one or more stationary technical units (plants) and of all the directly associated activities. The term 'livestock' should also be taken to mean *'domesticated animals such as cattle, pigs, poultry, sheep, horses, goats. Any creature kept for the production of food, wool, skin or fur or for the purpose of its use in the farming of the land or for amenity purposes'* (BREF, 2015:810).

That BREF 2015 covers the following farm processes and activities:

- Nutritional management of poultry and pigs
- Feed preparation (milling, mixing and storage)
- Rearing (housing) of poultry and pigs
- Collection and storage of manure
- Processing of manure
- Land spreading of manure
- Storage of dead animals

¹³ New installation permitted once no adverse effect on site integrity is concluded for the relevant Natura 2000 site.

¹⁴ Existing permitted installation.

It does not address the disposal of dead animals. The guidance states that the central environmental issue for the poultry or pig rearing sectors is manure management: amount produced, composition, method of removal, storage, treatment and its application on land (BREF, 2015:158). Manure spreading is an important aspect which is not currently included within the Industrial Emissions Directive but in the BREF (2015) document is considered in great detail. In many cases manure spreading is not an 'on-farm' activity, as operators don't always have the land available to spread manure 'on-farm' so it is often spread by third parties 'off-farm' on other sites thus falling outside the scope of the Industrial Emissions Directive. As a result of this, we must consider that land spreading of manure may or may not be within the installation boundary¹⁵. In some countries, as in Spain, in the integrated environmental permits there is an obligation to sign contracts with landowners for manure spreading on their holdings.

The reason for considering manure spreading in such detail in the updated BREF (2015) is to prevent the benefits of a measure applied by a farmer to reduce emissions in the beginning of a chain being cancelled out by the application of poor spreading management or other such techniques at the latter end of the chain. BAT conclusions (2016) on manure spreading shall be included in the updated permits of all intensive rearing of poultry or pigs under Industrial Emissions Directive installations, although how it will be implemented when occurring 'off-farm' remains open to discussion.

Portuguese legislation defines that a livestock installation includes:

- Any facility, building or group of buildings
- Technical plants
- Composting plants and biogas production
- Livestock effluents in the meaning of Regulation EC n° 1069/2009 of the European Parliament and the Council of 21 October 2009 (animal by-products and derived products)
- Associated structures for exploitation and places not completely closed or covered, as well as mobile facilities or structures or parks that prevent the soil from being used or where animals or livestock effluents can be kept or manipulated, in particular intended for the shelter of the animals, or for their management, aside from surface grazing

In 2015, the European Commission published a report on the "Interpretation of definitions of project categories of Annex I and Annex II of the Environmental Impact Assessment Directive" that stresses the different interpretations member states make of the definition project and installation under that Directive, but also on Directives for Strategic Environmental Projects and Industrial Emissions, and also the problem of deciding whether individual projects fall

¹⁵ As showed in European Court of Justice Case C113/12 <http://curia.europa.eu/juris/liste.jsf?language=en&num=C-113/12>.

within its scope, matters that are prejudicial to the effectiveness of the implementation of these directives.

The report also contains a specific part for Annex I (17), stating that: *According to settled case law, the meaning and scope of terms for which European Union law provides no definition must be determined by considering their usual meaning in everyday language, while also taking into account the context in which they occur and the purposes of the rules of which they are part, providing some examples (EC, 2015: 32, 33).*

Table 3.1: Definitions of 'project', 'installation' and 'livestock' stated on Directives and examples from Member States' legislation

Country/ Legislation	Definition of Project	Definition of Installation	Definition of livestock (type of installation)
Portugal	Transposition of IED	Same as IED (Not defined)	Same as IED (Not defined)
		A stationary technical unit within which one or more activities listed in Annex I or in Part 1 of Annex VII are carried out, and any other directly associated activities on the same site which have a technical connection with the activities listed in those Annexes and which could have an effect on emissions and pollution.	Note: Final draft IRPP BREF (2015:806, 809): Intensive production is a farming characterized by high inputs of capital and resources etc. That aims to make best use of the genetic potential of crops and livestock to achieve high outputs. Extensive farming is characterized by relatively low inputs (of capital and resources) and low outputs (of crop and animal products). Often considered to have less impact on the environment than intensive production
	Transposition of EIAD	Same as EIAD (Not defined)	Same as EIAD (Not defined)
		The execution of construction works or of other installations or schemes, - other interventions in the natural surroundings and landscape including those involving the extraction of mineral resources.	
	Transposition of HD	Same as HD (Not defined)	Same as HD (Not defined)
	Legislation for the permitting of this economic activity		Any facility, building or group of buildings, technical plants, composting plants and biogas production, livestock effluents in the meaning of Regulation (EC) n° 1069/2009 of the European Parliament and the Council of 21 October 2009 (animal by-products and derived products), associated structures for the exploitation and places not completely closed or covered, as well as mobile facilities or structures or parks that prevent the soil from being used, where animals or livestock effluents can be kept or manipulated, in particular intended for the shelter of the animals, or for their management, aside from surface grazing. Extensive Livestock production in animal farming uses grazing in its production process, the header does not exceed 1.4 Normal Heads / hectare, which may be extended up value of 2.8 Normal Heads / hectare if two thirds of the food needs are provided by grazing and also developing cattle ranching on low production intensity or low stocking density in case of livestock species other than herbivores. Intensive production refers to all other productions.

Table 3.1: Definitions of 'project', 'installation' and 'livestock' stated on Directives and examples from Member States' legislation

Country/ Legislation	Definition of Project	Definition of Installation	Definition of livestock (type of installation)
Germany	Transposition of IED	<p>Same as IED (Not defined)</p> <p>§ 3 (5) Federal Immission Control Act "Installation" shall mean any operating plants and other stationary facilities, any machines, equipment and other non-stationary technical facilities, any premises used to store or deposit or to carry out work likely to cause emissions (except routes). § 1 (2) Ordinance on Installations Subject to Licensing: The need for a permit shall cover all planned parts of installations or process stages which are required for the operation of the installation and auxiliary facilities associated with parts of installations and process stages which may be relevant to</p> <ul style="list-style-type: none"> - the occurrence of harmful environmental impacts - precaution against harmful environmental impacts or - the occurrence of other risks, significant disadvantages or significant disturbances 	<p>Same as IED (Not defined)</p> <p>Note: Final draft IRPP BREF (2015:806, 809): Intensive production is a farming characterized by high inputs of capital and resources etc. That aims to make best use of the genetic potential of crops and livestock to achieve high outputs. Extensive farming is characterized by relatively low inputs (of capital and resources) and low outputs (of crop and animal products). Often considered to have less impact on the environment than intensive production</p>
	Transposition of EIAD	<p>§ 2 (2) EIA Act the construction and operation of an technical installation, the construction of other installations, the execution of other measures with impact on nature and landscape as well as changes</p>	<p>Same as EIAD (Not defined)</p>
	Transposition of HD	<p>Same as HD (Not defined)</p>	<p>Same as HD (Not defined)</p>

Table 3.1: Definitions of 'project', 'installation' and 'livestock' stated on Directives and examples from Member States' legislation

Country/ Legislation	Definition of Project	Definition of Installation	Definition of livestock (type of installation)
Spain	Transposition of IED	Same as IED (Not defined)	The same as IED A stationary technical unit within which one or more activities listed in Annex I or in Part 1 of Annex VII are carried out, and any other directly associated activities on the same site which have a technical connection with the activities listed in those Annexes and which could have an effect on emissions and pollution.
	Transposition of IED	Same as IED (Not defined)	Same as IED (Not defined)
	Transposition of HD	Same as HD (Not defined)	Same as HD (Not defined)
	Legislation for the permitting of this economic activity	Not defined	Not defined
	Transposition of IED	The execution of construction works or of other installations or schemes, as well as decommissioning or any other interventions in the natural environment and landscape including those aimed at the exploitation of soil and subsoil natural resources as well as sea waters	Regulatory framework: Installations for the rearing of livestock regulated by the Royal Decree 348/2000 of 10 of March by which the Directive 98/58/CE of 20 July 1998 concerning the protection of animals kept for farming purposes is transposed
	Transposition of HD	Same as HD (Not defined)	Same as HD (Not defined)
	Legislation for the permitting of this economic activity	Not defined	Not defined

Table 3.1: Definitions of 'project', 'installation' and 'livestock' stated on Directives and examples from Member States' legislation

Country/ Legislation	Definition of Project	Definition of Installation	Definition of livestock (type of installation)
England	Transposition of IED	Same as IED (Not defined)	Same as IED (Not defined)
		A stationary technical unit within which one or more activities listed in Annex I or in Part 1 of Annex VII are carried out, and any other directly associated activities on the same site which have a technical connection with the activities listed in those Annexes and which could have an effect on emissions and pollution.	Note: IRPP BREF (2015:806, 809): Intensive production is a farming characterized by high inputs of capital and resources etc. That aims to make best use of the genetic potential of crops and livestock to achieve high outputs. Extensive farming is characterized by relatively low inputs (of capital and resources) and low outputs (of crop and animal products). Often considered to have less impact on the environment than intensive production
	Transposition of EIAD	Defined as an 'EIA development' not project. A development that is either: a) schedule 1 developments b) Schedule 2 developments likely to have significant effects on the environment by virtue of factors such as nature, size and location.	Same as EIAD (Not defined)
	Transposition of HD	Same as HD (Not defined)	Same as HD (Not defined)

3.2 THRESHOLDS FOR LIVESTOCK PROJECTS

Habitats Directive does not include thresholds to support screening decisions for specific types of installations (for example livestock¹⁶), both for a new installation or changes to an existing installation.

Looking for criteria provided in other EU directives, we can see that Industrial Emissions Directive includes threshold for pigs and poultry livestock, such as Annex I of Environmental Impact Assessment Directive. Additionally Annex II of Environmental Impact Assessment Directive includes other livestock and several Member States explicitly include the intensive rearing of calves and cattle in their national EIA legislation. In at least one Member State, this category is considered to cover amongst other species the rearing of rabbits, ducks, geese and horses, and another Member State includes ostriches and ostrich-like animals (EC, 2015:37)¹⁷.

Table 3.2 shows that Portugal, Spain, Germany and England have transposed Habitats Directive into its national legislation, but also of Industrial Emissions Directive and Environmental Impact Assessment Directive, that makes use of the terms applied in the Directives and applying the precautionary principle providing a case by case analysis to decide which installations fall under its scope. These transpositions require changes to the installations to be evaluated, and there is a concern that more projects than those regulated by the Industrial Emissions Directive need a permit to prevent environmental impacts.

The requirements concerning smaller farms differ very much throughout Europe. The findings of the IMPEL project 2014 “Nature protection in permitting and inspection – implementation of Article 6 (3) of the Habitats Directive”¹⁸ and the information of table 3.2, on Annex III, shows that:

- a) in some countries all kinds of farms need a permit.
- b) in some countries the competent permitting authority is the same for small and large pig and poultry farms, whereas in others local authorities issue the permits for small farms and regional or state authorities are responsible for larger farms and IED installations respectively.

However, regardless of the size and the competent authority responsible, due to their potential impacts on Natura 2000 sites all new or changing farm projects have to undergo the Article 6 (3) procedure.

¹⁶ Domesticated animals such as cattle, pigs, poultry, sheep, horses, goats. Any creature kept for the production of food, wool, skin or fur or for the purpose of its use in the farming of the land or for amenity purposes (final draft IRPP BREF, 2015:810) .

¹⁷ Available at http://ec.europa.eu/environment/eia/pdf/cover_2015.pdf.

¹⁸ <http://www.impel.eu/wp-content/uploads/2015/11/FR-2014-14-Nature-protection-in-permitting-and-inspection-of-industrial-installations.pdf>

BREF (2015: 809) defines, on a large scope, that intensive production is *farming characterised by high inputs of capital and resources etc. That aims to make best use of the genetic potential of crops and livestock to achieve high outputs.*

The EC report (2015: 40-41) notes that when interpreting the term 'intensive', similar reasoning to that for intensive fish farming can be used to describe the main features as implying the use of techniques designed to increase the production of the species in question beyond the natural capacity of the environment or culture stage, up to and including harvesting. Typically, this practice will involve the input of an additional compound feed to compensate for the lack of naturally available food at the density at which the animals are farmed. Husbandry techniques, which are also applicable to non-intensive farming, including the use of medicines and aeration of the water to meet the needs of the animals and ensure their health and welfare may also be used. Waste products should also be managed satisfactorily.

Portuguese legislation (Table 3.2) confirms that intensive livestock production in animal farming is 'all livestock that cannot be defined as extensive', meaning that:

- it uses grazing on its production process
- the head count does not exceed 1.4 Normal Heads / hectare, which may be extended up value of 2.8 Normal Heads / hectare if two thirds of the food needs are provided by grazing, and it also
- develops cattle ranching on low production intensity or low stocking density in case of livestock species other than herbivores.

Table 3.2: Threshold for projects of livestock stated in EU legislation and examples from Member States' legislation

EU/MS		Threshold or criteria applied for livestock projects			
EU	IED	EIAD, Annex I	EIAD, Annex II	HD	Legislation for the permitting of this economic activity
New projects	The need for environmental permitting is mandatory for intensive rearing of poultry or pigs: (a) with more than 40 000 places for poultry; (b) with more than 2 000 places for production pigs (over 30 kg), or (c) with more than 750 places for sows.	EIA is mandatory for installations for the intensive rearing of poultry or pigs with more than: a) 85000 places for broilers, 60000 places for hens; (b) 3000 places for production pigs (over 30 kg); or (c) 900 places for sows.	EIA is mandatory for intensive livestock installations (projects not included in Annex I), project category not limited to pigs and poultry (Note)	Not defined. All projects must be considered	Not applicable
Change projects	Operators should notify the competent authority of any planned change which might affect the environment. Substantial changes to installations which may have significant negative effects on human health or the environment should not be made without a permit granted in accordance with this Directive; Any change in the nature or functioning or an extension of an installation shall be deemed to be substantial if the change or extension in itself reaches the capacity thresholds set out in Annex I.	Any change to or extension of projects listed in Annex I where such a change or extension in itself meets the thresholds, if any, set out in this Annex; Any change or extension of projects listed in Annex I, already authorized, executed or in the process of being executed, which may have significant adverse effects on the environment.	Any change to or extension of projects listed in Annex II where such a change or extension in itself meets the thresholds, if any, set out in this Annex; Any change or extension of projects listed in Annex II, already authorized, executed or in the process of being executed, which may have significant adverse effects on the environment.	Not defined. All changes must be considered	Not applicable

Note: By way of example, national EIA legislation in several Member States explicitly includes the intensive rearing of calves and cattle under this project category. In at least one Member State, this project category is considered to cover amongst other species the rearing of rabbits, ducks, geese and horses. Another Member State includes ostriches and ostrich-like animals (CE, 2015:37).

Table 3.2: Threshold for projects of livestock stated in EU legislation and examples from Member States' legislation

EU/MS		Threshold or criteria applied for livestock projects			
Portugal	Transposition of IED	Transposition of EIAD, Annex I	Transposition of EIAD, Annex II	Transposition of HD and its regulation	National Legislation for the permitting of this economic activity
New projects	Same as IED	Same as IED	EIA is mandatory for the following Intensive livestock installations: ≥ 600 bovine; for other kind of animals a case by case examination of equivalent heads is required; In Natura 2000 sites: ≥ 30 000 hens or chickens; ≥ 1000 production pigs (overs 30 kg). ≥ 300 sows; ≥ 250 bovines; for other kind of animals a case by case examination of equivalent heads is required.	Same as HD.	Permitting is divided into three classes according to the number of Normal Heads (NH), considering the animal species, age, body weight and production, in relation to food needs and production of livestock effluents. There is a table for the conversion of NH into the units used in IED and EIAD.
	Change projects	Same as EU plus: Any extension greater than 20% of total capacity or total area of the installation or project or, when inferior, considered that may have significant adverse effects on the environment, decided on a case by case examination.	Same as EU plus: Any extension greater than 20% of total capacity or total area of the installation or project or, when inferior, considered that may have significant adverse effects on the environment, decided on a case by case examination.	Same as HD.	Operators should notify the competent authority of any planned change which might affect the environment; The operator will need permission if the alteration causes the installation to fall under the scope of IED or EIAD, exceeds 30% of the original capacity, causes a change of permitting class, or causes substantial impact on the environment (analysis through environmental indicators). Changes on buildings need a permit, with consultation of the nature conservation authority.

Table 3.2: Threshold for projects of livestock stated in EU legislation and examples from Member States' legislation

EU/MS		Threshold or criteria applied for livestock projects			
Spain	Transposition of IED	Transposition of EIAD, Annex I	Transposition of EIAD, Annex II	Transposition of HD and its regulation	National Legislation for the permitting of this economic activity
New projects	Same as IED	<p>EIA is mandatory for the following intensive poultry and pigs installations with a capacity of:</p> <ul style="list-style-type: none"> > 40.000 places for hens > 55 000 places for broilers > 2 000 places for fattening pigs > 750 places for sows 	<p>Screening of intensive livestock installations with a capacity of:</p> <ul style="list-style-type: none"> > 2.000 places for sheep and goats > 300 places for dairy cattle > 600 places for beef cattle > 20.000 places for rabbits 	Same as HD	<p>Permitting & Register is divided into two classes according to the number of Normal Heads (NH):</p> <p>a.- Permitting of installations above IED thresholds. Competent authority: Environmental Authority</p> <p>b.- Register of installations below IED thresholds. Competent authorities: Agriculture Authority and Local Authorities</p> <p>There is a table for the conversion of Normal Heads into the units used in IED and EIAD considering the animal species, age, body weight and production.</p>
	<p>Projects included in Annex II when the Competent Environmental Authority so decides on a case by case examination following the criteria of Annex III</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Regional (Galicia) legislation on environmental incidence. Installations for the intensive rearing of livestock with capacities between:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">1.000 - 40.000 places for hens</td> <td style="width: 50%; text-align: center;">50 – 300 places for dairy cattle</td> </tr> <tr> <td style="text-align: center;">1.000 - 55 000 places for broilers</td> <td style="text-align: center;">75 – 600 places for beef cattle</td> </tr> </table> </div>	1.000 - 40.000 places for hens	50 – 300 places for dairy cattle	1.000 - 55 000 places for broilers	
1.000 - 40.000 places for hens	50 – 300 places for dairy cattle				
1.000 - 55 000 places for broilers	75 – 600 places for beef cattle				

Table 3.2: Threshold for projects of livestock stated in EU legislation and examples from Member States' legislation

EU/MS	Threshold or criteria applied for livestock projects				
Spain	Transposition of IED	Transposition of EIAD, Annex I	Transposition of EIAD, Annex II	Transposition of HD and its regulation	National Legislation for the permitting of this economic activity
Change Projects	<p>Same as IED plus: Any substantial change of projects included in Annex I. Criteria: incidence of the change on the safety, human health and the environment on the following aspects: installation size and output; raw materials consumption; water and energy consumption; waste generation; quality and regeneration capacity of natural resources of the area of affection; level of pollution produced; risk of accidents; increase in hazardous substances use.</p>	<p>Same as EIAD plus: Any change of projects included in Annex I or Annex II which in itself reaches the capacity thresholds set out in Annex I.</p>	<p>Same as EIAD plus: Any change of projects (different from those mentioned in the previous column) likely have significant adverse effects on the environment (significant increase in emission into air and into surface water, in waste production or in raw materials consumption; effects on Natura 2000 sites; significant effects on the cultural heritage)</p>	<p>Same as HD.</p>	<p>Operators should notify the competent authority of any planned change which might affect the environment; The operator will need permission if the alteration causes the installation to fall under the scope of IED or EIAD, or represents a substantial change following the criteria defined in the previous columns.</p>

Table 3.2: Threshold for projects of livestock stated in EU legislation and examples from Member States' legislation

EU/MS		Threshold or criteria applied for livestock projects				
Germany	Transposition of IED	of	Transposition of EIAD, Annex I	Transposition of EIAD, Annex II	Transposition of HD and its regulation	National Legislation for the permitting of this economic activity
New Projects	Same as IED plus mixed farm projects		EIA is mandatory for intensive rearing of poultry and pigs with the following capacities: 60000 or more places for hens 85000 or more places for young hens 85000 or more places for broilers 60000 or more places for turkeys 3000 or more places for fattening pigs 900 or more places for sows with piglets below 30 kg 9000 or more places for piglets up to 30 kg plus mixed farm projects	General screening A Site specific screening S places for hens: 40000 up to ≤ 60000 A 15000 up to ≤ 40000 S places for young hens: 40000 up to ≤ 85000 A 30000 up to ≤ 40000 S places for broilers: 40000 up to ≤ 85000 A 30000 up to ≤ 40000 S places for turkeys: 40000 up to ≤ 60000 A 15000 up to ≤ 40000 S places for cattle: 800 and more places A 600 up to ≤ 800 places S places for calf: 1000 or more A 500 up to ≤ 1000 S places for fattening pigs: 2000 up to ≤ 3000 A 1500 up to ≤ 2000 S places for sows with piglets below 30 kg: 750 up to ≤ 900 A 560 up to ≤ 750 S places for piglets: 6000 up to ≤ 9000 A 4500 up to ≤ 6000 S plus regulations for mixed farm projects	Same as HD	More projects than regulated by the IED need an environmental permit. Depending on their capacity these are the following projects (see Ordinance on Installations Subject to Licensing - 4 th ordinance to the Federal Immission Control Act): Places for hens: 15000 up to ≤ 40000 places for young hens: 30000 up to ≤ 40000 places for broilers: 30000 up to ≤ 40000 places for turkeys: 15000 up to ≤ 40000 places for cattle: 600 or more places for fattening calf: 500 or more places for fattening pigs: 1500 up to ≤ 2000 places for sows with piglets below 30 kg: 560 up to ≤ 750 places for piglets: 4500 up to ≤ 6000 plus mixed farm projects. Farm projects below these thresholds need a permit according to the Federal Building Code

EU/MS		Threshold or criteria applied for livestock projects				
Germany	Transposition of IED	Transposition of EIAD, Annex I	Transposition of EIAD, Annex II	Transposition of HD and its regulation	National Legislation for the permitting of this economic activity	
Change projects	Same as IED	<p>EIA has to be carried out for changes and extensions, if</p> <p>a. the project itself reaches or exceeds the thresholds of Annex 1 to the Federal Environmental Impact Assessment Act (UVPG) through the change or extension</p> <p>the result of a preliminary evaluation (screening) shows that the project may have significant adverse effects on the environment. In this evaluation previous changes and extensions are included for which so far no assessment has been carried out.</p>	No difference to previous column.	For any project that needs a permit or notification screening and/or Appropriate Assessment has to be carried out	<p>Federal Immission Control Act:</p> <p>§ 16: Major alterations of installations subject to licensing</p> <p>Any alteration of an installation subject to licensing shall require a license if the alteration may lead to adverse effects. A license shall be required if the alteration or extension leads to a capacity of the installation that reaches the limits or installation sizes stated in the Ordinance on Installations Subject to Licensing.</p> <p>§ 15: Minor Changes: Any alteration of an installation shall be notified with all documents needed for the assessment to the competent authority in writing at least one month before this alteration is due to be undertaken, if the alteration may have an effect on any of the protected resources and no license is applied for. The competent authority shall examine without undue delay, but not later than one month after receipt of the documents whether the alteration is subject to licensing.</p>	

Table 3.2: Threshold for projects of livestock stated in I EU legislation and examples from Member States' legislation

EU/MS		Threshold or criteria applied for livestock projects				
England	Transposition of IED	Transposition of EIAD, Annex I	Transposition of EIAD, Annex II	Transposition of HD and its regulation	National Legislation for the permitting of this economic activity	
New projects	Same as IED.	Same as EIAD. EIA is mandatory for installations for the intensive rearing of poultry or pigs with more than: a) 85000 places for broilers, 60000 places for hens; (b) 3000 places for production pigs (over 30 kg); or (c) 900 places for sows.	EIA is mandatory for Intensive livestock installations (projects not included in Annex I)	Same as HD. Not defined. All projects must be considered	Environmental	Permitting
Change projects	Same as IED.	Same as EIAD Any change to or extension of projects listed in Annex I where such a change or extension in itself meets the thresholds, if any, set out in this Annex; Any change or extension of projects listed in Annex I, already authorized, executed or in the process of being executed, which may have significant adverse effects on the environment.	Same as EU Any change to or extension of projects listed in Annex II where such a change or extension in itself meets the thresholds, if any, set out in this Annex; Any change or extension of projects listed in Annex II, already authorized, executed or in the process of being executed, which may have significant adverse effects on the environment.	Same as HD. Not defined. All changes must be considered	Environmental	Permitting

3.3 IN-COMBINATION IMPACTS OF LIVESTOCK PROJECTS

Article 6 (3) of Habitats Directive states that any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, *either individually or in combination with other plans or projects, shall be subject to appropriate assessment* of its implications for the site in view of its conservation objectives.

In this context, the analysis of cumulative impacts as part of the in-combination process is clearly important, because there is a need to consider if a project can cause likely significant effects both individually and considering other new or existing projects, in order to evaluate the overall cumulative effect on a Natura 2000 site's conservation objectives.

In 1999, the European Commission published the document “Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions”¹⁹, describing several methods and tools for conservation assessment. Within these guidelines, cumulative impacts were taken to mean “impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project”. In Denmark, a threshold is applied for in combination assessments by using specific distances to identify total contributions to Natura 2000 habitats from each production unit (see Section 6.2.1.5.).

Cumulative effects can also be defined as *those that result from additive impacts caused by other past, present or reasonably foreseeable actions, together with the plan, programme or project itself and synergistic impacts (in-combination) that arise from the reaction between impacts of a development plan, programme or project on different aspects of the environment*. In association with this definition comes that effects are the consequences of impacts (Renewable UK, 2013).

The evaluation of environmental impacts needs to consider as a baseline, the following information (IMARES, 2014; EC, 1999; EC, 2001²⁰):

- Temporal: including a time frame based on the effects of the project development for the coming years, but also within this timeframe the decommissioning of the existing projects.
- Spatial: The study area to be considered.
- Receiving pathways and affected environment: the receiving and pathways for affected environment, such as soil, water and air and the potential causes and effects (also in combination) of impacts such as wastewater, water consumption, wastes, noise and chemical products.
- Activities and developments to be taken into account: The effects from other projects and from climate change on species that are most likely to be affected by these connected projects .

¹⁹ Guidelines on the Assessment of Indirect and Cumulative Impacts as well as Impact interactions, <http://ec.europa.eu/environment/archives/eia/eia-studies-and-reports/guidel.htm>

²⁰ Assessment of plans and projects significantly affecting Natura 2000 sites, http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pdf

To evaluate all of the above, it is first necessary to define relevant time and spatial boundaries in order to select projects and sources of impacts that should be assessed together - even if they are not located close together - or where species or other factors such as sources of food are dispersed (EC, 2001: 13,19). It is also crucial to identify potential cumulative pathways (for example via water or air etc.) and to examine site conditions to identify where vulnerable aspects of the structure and function of the site are at risk (EC, 2001: 13,19). Projects selected for consideration can include plans or projects which are completed, approved but uncompleted or proposed (EC, 2000: 34-35).

The assessment must also ensure that the geographical scope for the provisions of Article 6(3) is not restricted to plans and projects which exclusively occur exclusively within, or partially within a protected site; they must also target developments situated outside the site but likely to have a significant effect on it (EC, 2000: 30).

The assessment process can run into a number of difficulties on the basis of a need to consider cumulative effects, for example if: a) there is a lack of definition of other projects to be evaluated (for example types of projects and plans and thresholds applied, date of installation or foreseeable installation, distance to the project or plan in question), or b) if the authority responsible for screening lacks information of those other plans or projects (often the case where projects are determined by several different authorities depending on thresholds implemented). In these cases, the competent authority has to assure the collection of necessary information either from own resources or from other competent bodies

During the IMPEL project on “Nature protection in permitting and inspection of industrial installations – Implementation of Art. 6(3) of the Habitats Directive (phase 2)”, all Member States showed concern for the trend of ‘salami-slicing’ of projects – one of a number of concerns raised as part of the in-combination assessment process.

‘Salami slicing’ means the splitting of projects in order to reduce numbers below a threshold and exclude it from the requirements of the Habitats Directive²¹.

To minimise the possibility of salami slicing, it is important to carefully analyse data concerning the proponent, such as company contracts and their owners or managers, in order to evaluate the connection between projects presented individually but that could be associated with others. On the previous IMPEL project (2014, phase 2) some information was gathered concerning this subject , such as:

- Provisions in Spanish national legislation for Environmental Impact Assessment establishes that the application of projects submitted separately, but reaching the thresholds for Annex I (mandatory environmental impact assessment) as a whole will be subjected to a mandatory environmental impact assessment procedure.

²¹ Salami slicing refers to the practice of splitting an initial project into a number of separate projects, which individually do not exceed the threshold set or do not have significant effects on a case-by-case examination and therefore do not require an impact assessment but may, taken together, have significant environmental effects (See COM/2003/0334 final [<http://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:52003DC0334>]).

Applications for projects submitted separately, but, reaching the thresholds of Annex II (screening) as a whole will also be subjected to screening.

- Spain has legislative provisions which ensure that applications for a substantial change (for example more than 50 % increase in capacity, resources consumption, waste production) are subject to the Industrial Emissions Directive or Environmental Impact Assessment Directive procedure, and that there is also an assessment of cumulative effects when the same proponent submits applications for two or more installations (Example: Wind farms proponents may be asked to change their projects in order to share some infrastructure).
- Portuguese legislation for Environmental Impact Assessment tries to prevent “salami slicing” by establishing a screening decision based on the cumulative effects of project types listed under Annex II of the Environmental Impact Assessment Directive, which are not meeting the thresholds established given its nature, location and characteristics, but that may have significant environmental impacts.
- Within Dutch legislation, there is a precise definition of an activity or installation – a process called “inrichting”, which makes it practically impossible to split an installation into two or three separate activities simply to acquire more emission rights. Where an installation does nevertheless split, the administration rights will be split as well, and new permit procedures will be started.
- In Germany, the Federal Emission Control Act defines the limits of an installation, and in practice it is possible to build installations with different owners on different sites - but the permit authority has to check the company contracts and its owners or managers to ensure that the activity has not been ‘salami-sliced’.

To ensure proper consideration of in-combination impacts, it is important to ensure guidance on the following:

- i. Clarify the definition of a (pig and poultry farm or other livestock) project and its boundaries, including the definition of changes in an existing installation that can cause significant effects and therefore must be considered a project
- ii. Ensure the proper evaluation of cumulative effects, taking into consideration temporal and spatial delimitation and defining other existing and foreseeable projects that must be considered
- iii. Ensure that public entities responsible for the evaluation of cumulative effects have the knowledge of all existing and foreseeable projects and plans that need to be considered
- iv. Ensure that a proponent of a project cannot divide it into several pieces, presenting each one as a project, and fall under a settled threshold or criteria under which AA is exempted

4 POTENTIAL IMPACTS OF PIG AND POULTRY FARMS ON NATURA 2000 SITES AND WILDLIFE

4.1 INTRODUCTION

For the identification of potential impacts of pig and poultry farms on Natura 2000 sites and wildlife, the approach of Habitats Directive for appropriate assessment will be followed in this guidance. As noted in Chapter 2, the appropriate assessment is performed in view of the site's conservation objectives and the potential impacts of pig and poultry farms are identified in the same framework.

This chapter addresses an initial screening stage, which requires the identification of potential impacts and the assessment of significance. Although the assessment of significance must be performed on a case by case basis, and the individual elements of each project likely to give rise to impacts should be identified beforehand, the purpose of this chapter is to identify the potential impacts of intensive pig or poultry farms. Although most of the information is given in the BREF (2015), it is general and refers to all farm sizes. Small farms have the similar production systems and consequently similar environmental impacts.

4.2 PRODUCTION SYSTEMS AND TECHNIQUES

Activities and production systems related to the pig and poultry farms that are relevant for consideration of their environmental impacts include (but not limited to) the following (detailed in the BREF (2015)):

- Animal housing
- End of pipe techniques to control emissions to air (and also to reduce odour) from animal houses, such as wet scrubbers and bio-filters
- Feed and drink supply
- Processing and storage of animal feed
- Collection and storage of manure
- On-farm manure processing, such as anaerobic digestion in a biogas plant
- On-farm manure spreading
- Off-farm manure spreading
- On-farm transport
- Maintenance and cleaning
- Storage of hazardous substances
- Production, storage and management of waste
- Storage and disposal of carcasses
- Treatment of waste water
- Heat and power production.

4.3 KEY ENVIRONMENTAL ISSUES OF PIG AND POULTRY FARMS: OVERVIEW

Some of the potential impacts of pig and poultry farms may be due to the location of the installations inside the boundaries of a Natura 2000 site. In these cases, habitat loss and disturbance to species may be included as relevant impacts. It is very probable that new pig and poultry farm projects proposing development inside Natura 2000 sites would be excluded after being subjected to appropriate assessment and EIA procedures, or they could be included in the list of excluded activities inside the boundaries of the site in its management plan or in the appropriate statutory, administrative or contractual measures as provide in Article 6(1) of the Habitats Directive. The impacts of existing pig and poultry farms inside Natura 2000 sites must not be overlooked when assessing new projects outside the boundaries. This is due to an obligation to take into account cumulative effects, especially those derived from nitrogen and phosphorus based emissions.

The most relevant impacts for activities located both within and outside of Natura 2000 site boundaries, as shown below (Table 4.1), are primarily due to nitrogen) and phosphorus emissions, which can produce impacts far away from the source via both air and water media. Under the provisions of Article 6(3) of the Habitats Directive, likely significant effects on Natura 2000 sites must be assessed independently of how far the plan or project is located. In some Member States standard screening distances for pig and poultry farms are established as in England (UK) where a 10 km screen is implemented on the basis that emissions reaching beyond this distance (following a generic risk assessment) are likely to be inconsequential. However, this still does not exclude a case by case approach where necessary.

Table 4.1 includes the environmental issues accompanying the major on-farms activities listed in section 4.2 of this guidance.

Table 4.1: Key environmental issues of the major on-farm activities

Activity	environmental issue	Potential impact on protected site(s)
	Potential emission	
Housing of animals: - the way the animals are stocked (cages, crates, free) - the system to remove and store (internally) the manure produced	NH ₃ , odour, noise, greenhouse gases (CH ₄ , N ₂ O, etc.), dust and fine dust particles (PM ₁₀); manure; waste water, other wastes (e. g. dead animals)	NH ₃ deposition - eutrophication Odour – attraction of wild animals Noise – disturbance Manure, waste water – surface water and groundwater pollution
Housing of animals: - the equipment to control and maintain the indoor climate and -the equipment to feed and water the animals	Noise, waste water, dust, CO ₂	Noise – disturbance waste water – surface water and groundwater pollution
Storage of feed	Dust and fine dust particles	NH ₃ deposition - eutrophication

	(PM10), waste	Odour – attraction of wild animals and vermin Noise – disturbance Manure, waste water – surface water and groundwater pollution
Storage of manure in a separate facility	NH ₃ , odour, emissions to soil, greenhouse gases	NH ₃ deposition - eutrophication Noise – disturbance Manure, waste water – surface water and groundwater pollution
Storage of residues other than manure	Odour, emissions to soil, groundwater	Odour – attraction of wild animals and vermin Noise – disturbance Manure, waste water – surface water and groundwater pollution
Storage of dead animals	Odour, pathogens	Odour – attraction of wild animals and vermin Pathogenes – infection of wild animals including rare species
Unloading and loading of animals	Noise, dust	Noise - disturbance
Application of manure on land	NH ₃ , odour, greenhouse gases, pathogens, emissions to soil, groundwater and surface water of nitrogen, phosphorus etc., noise	eutrophication (N, P) Noise – disturbance Manure, waste water – surface water and groundwater pollution
On-farm treatment of manure	NH ₃ , odour, greenhouse gases, waste water, emissions to soil	eutrophication (N, P) Noise – disturbance Manure, waste water – surface water and groundwater pollution
Milling and grinding of feed	Dust and fine dust particles (PM10), noise	Odour – attraction of wild animals
Treatment of waste water	Odour, waste water	
Incineration of dead animals	Emissions to air, odour	NO _x deposition, SO ₂ deposition
NB: NA = not applicable		

Within the BREF (2015: 158), manure is considered to be the central environmental issue for poultry and pig sector emissions: the amounts produced, the composition, method of removal, storage, treatment and its application on land. The process of nitrogen consumption, utilisation and losses in production of pigs for slaughter is well understood as shown in Figure 4.1. A similar level of understanding in poultry species is currently lacking.

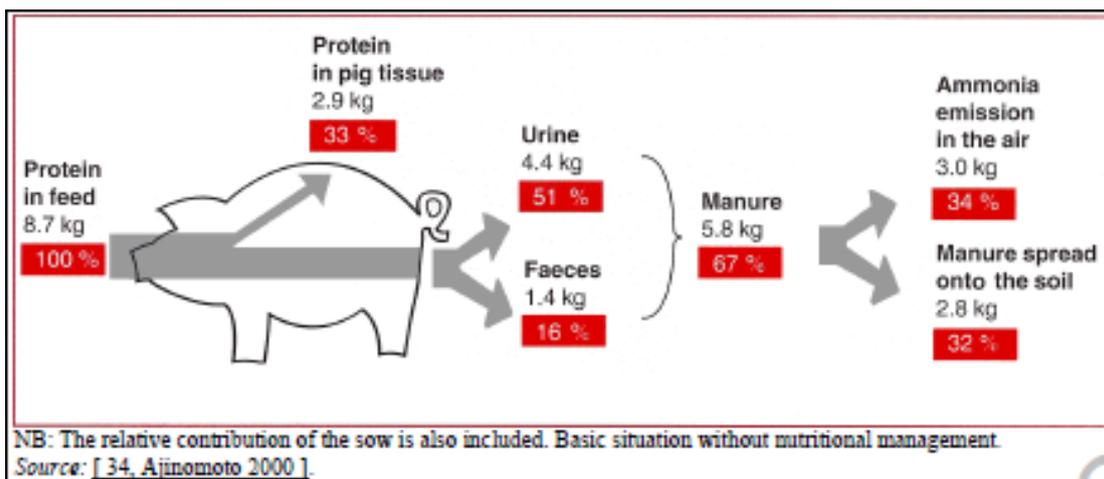


Figure 4.1: Consumption, utilisation and losses of protein in the production of a pig of 108 kg (BREF (2015: 34)

Most relevant emissions likely to produce effects on natural habitats and species are the ammonia emission into air and leaching of nitrate, nitrogen and phosphorus compounds into the soil and groundwater.

4.4 EMISSIONS TO AIR FROM PIG AND POULTRY FARMS.

Ammonia (NH₃)

Ammonia emissions from intensive agricultural systems are the main pollutant to air from this sector, and whose deposition is one of the major drivers of biodiversity loss in Europe. In addition to the effects of long-range pollutant transport, ammonia has a considerable effect at a local scale, with emission and receptor areas often closely located in the rural landscape and natural habitats - mainly because NH₃ is a heavy particle that drops out of the atmosphere quite quickly and hence won't travel long distances.

For all industry sectors covered by European Pollutant Release and Transfer Register (E-PRTR), emissions of ammonia from pig and poultry farms represent 83.2 % of the total ammonia emissions as shown in Figure 4.2 (E-PRTR 2014)²² (Coverage: EU-27 plus Iceland, Liechtenstein, Norway and Serbia; industry sectors covered by Annex I to the E-PRTR with capacity thresholds described therein; installations with emissions of ammonia of more than 10t/year, normal operation).

²² <http://prtr.ec.europa.eu/>

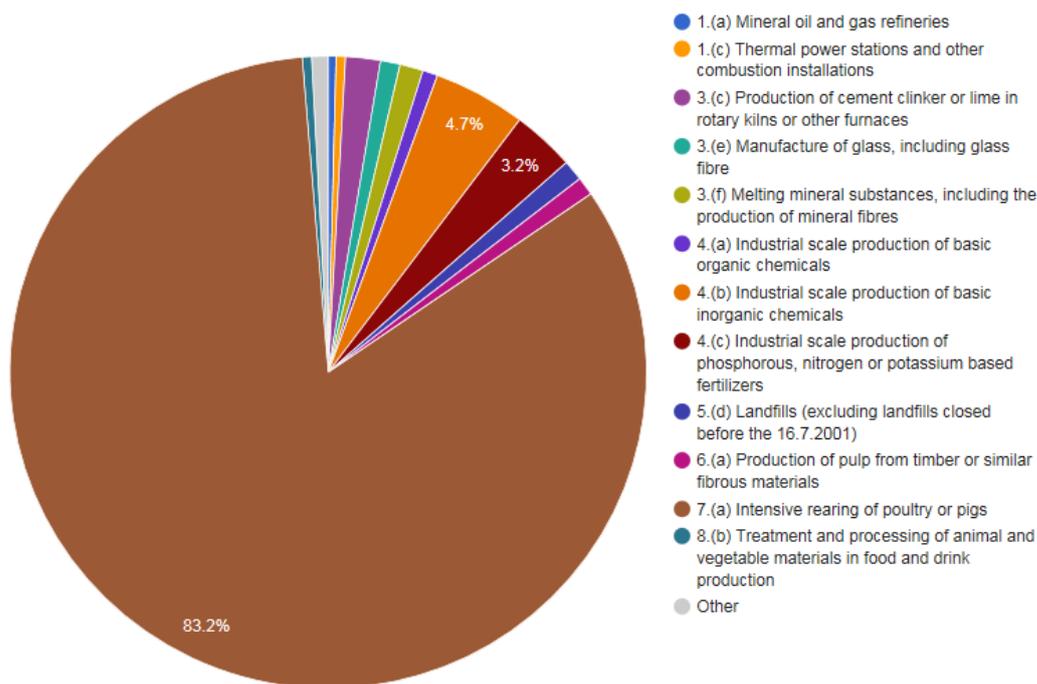


Figure 4.2: Portion of ammonia emissions from E-PRTR installations (E-PRTR 2014 European Environment Agency)

Within the BREF (2015), sections 5.2. and 5.3. establish Best Available Techniques and associated limit values (BAT-AELs) for ammonia emissions to air from buildings housing pigs, laying hens and broilers with a final weight of up to 2.5 kg respectively. The BAT-AEL are listed in Tables 4.2 and 4.3 of this document below, as included in the BAT Conclusions (2017). There are no BAT-AEL's established in the BREF (2015) for emissions from manure storage, on-farm processing and treatment of pig and poultry manure, land spreading of pig and poultry manure or for emissions from an animal house for pigs or poultry other than of ammonia to air. BAT-AEL's are also lacking for emissions to air from poultry housing other than laying hens and broilers with a final weight of up to 2.5 kg (e.g. ducks, turkey and guinea fowl).

As shown in Table 4.2, ammonia emissions to air correlate with farm size, given by its capacity measured (number of animal places as established in the IED).

Table 4.2: BAT-AEL for ammonia emissions from pig houses (BAT Conclusions, 2017)

BAT-AEL for ammonia emissions to air from an animal house for pigs		
Parameter	Animal category	BAT-AEL ⁽¹⁾ (kg NH ₃ /animal place/year)
Ammonia expressed as NH ₃	Mating and gestating sows	0.2 – 2.7 ⁽²⁾ ⁽³⁾
	Farrowing sows (including piglets) with crates	0.4 – 5.6 ⁽⁴⁾
	Weaners	0.03 – 0.53 ⁽⁵⁾ ⁽⁶⁾
	Fattening pigs	0.1 – 2.6 ⁽⁷⁾ ⁽⁸⁾

⁽¹⁾ The lower end of the range is associated with the use of an air cleaning system.
⁽²⁾ For existing plants using a deep pit in combination with nutritional management techniques, the upper end of the BAT-AEL is 4.0 kg NH₃/animal place/year.
⁽³⁾ For plants using BAT 30.a6, 30.a7 or 30.a11, the upper end of the BAT-AEL is 5.2 kg NH₃/animal place/year.
⁽⁴⁾ For existing plants using BAT 30.a0 in combination with nutritional management techniques, the upper end of the BAT-AEL is

7.5 kg NH₃/animal place/year.
 (5) For existing plants using a deep pit in combination with nutritional management techniques, the upper end of the BAT-AEL is 0.7 kg NH₃/animal place/year.
 (6) For plants using BAT 30.a6, 30.a7 or 30.a8, the upper end of the BAT-AEL is 0.7 kg NH₃/animal place/year.
 (7) For existing plants using a deep pit in combination with nutritional management techniques, the upper end of the BAT-AEL is 3.6 kg NH₃/animal place/year.
 (8) For plants using BAT 30.a6, 30.a7, 30.a8 or 30.a16, the upper end of the BAT-AEL is 5.65 kg NH₃/animal place/year.
 Notes:
 The BAT-AELs may not be applicable to organic livestock production. The associated monitoring is in BAT 25.
 BAT 30: In order to reduce ammonia emissions to air from each pig house, BAT is to use one or a combination of the techniques given in corresponding table of the BAT Conclusions (2017). It includes the BAT 30.c (Use of an air cleaning system, such as: 1) Wet acid scrubber. 2) Two-stage or three-stage air cleaning system. 3) Bioscrubber (or biotrickling filter).

Table 4.3: BAT-AEL for ammonia emissions from poultry houses (BAT Conclusions, 2017)

BAT-AEL for ammonia emissions to air from an animal house for poultry		
Parameter	Type of housing	BAT-AEL (kg NH ₃ /animal place/year)
Ammonia expressed as NH ₃	Laying hens: Cage housing system	0.02 – 0.08
	Laying hens: Non-cage housing system	0.02– 0.13 ⁽¹⁾
(1) For existing plants using a forced ventilation system and an infrequent manure removal (in case of deep litter with a manure pit), in combination with a measure achieving a high dry matter content of the manure, the upper end of the BAT-AEL is 0.25 kg NH₃/animal place/year.		
Parameter	Animal category	BAT-AEL ⁽¹⁾ ⁽²⁾ (kg NH ₃ /animal place/year)
Ammonia expressed as NH ₃	Broilers with a final weight of up to 2.5 kg	0.01 – 0.08
⁽¹⁾ The BAT-AEL may not be applicable to the following types of farming: extensive indoor, free-range, traditional free-range and free-range - total freedom, as defined in Commission Regulation (EC) No 543/2008 of 16 June 2008 laying down detailed rules for the application of Council Regulation (EC) No 1234/2007 as regards the marketing standards for poultry meat (OJ L 157, 17.6.2008, p. 46). ⁽²⁾ The lower end of the range is associated with the use of an air cleaning system.		

In order to continually achieve ammonia levels, as well as dust and odour emissions at the lower end of the ranges shown in the previous tables, air abatement techniques, such as combined multi-stage scrubbers can be used, as shown in Figure 4.3.

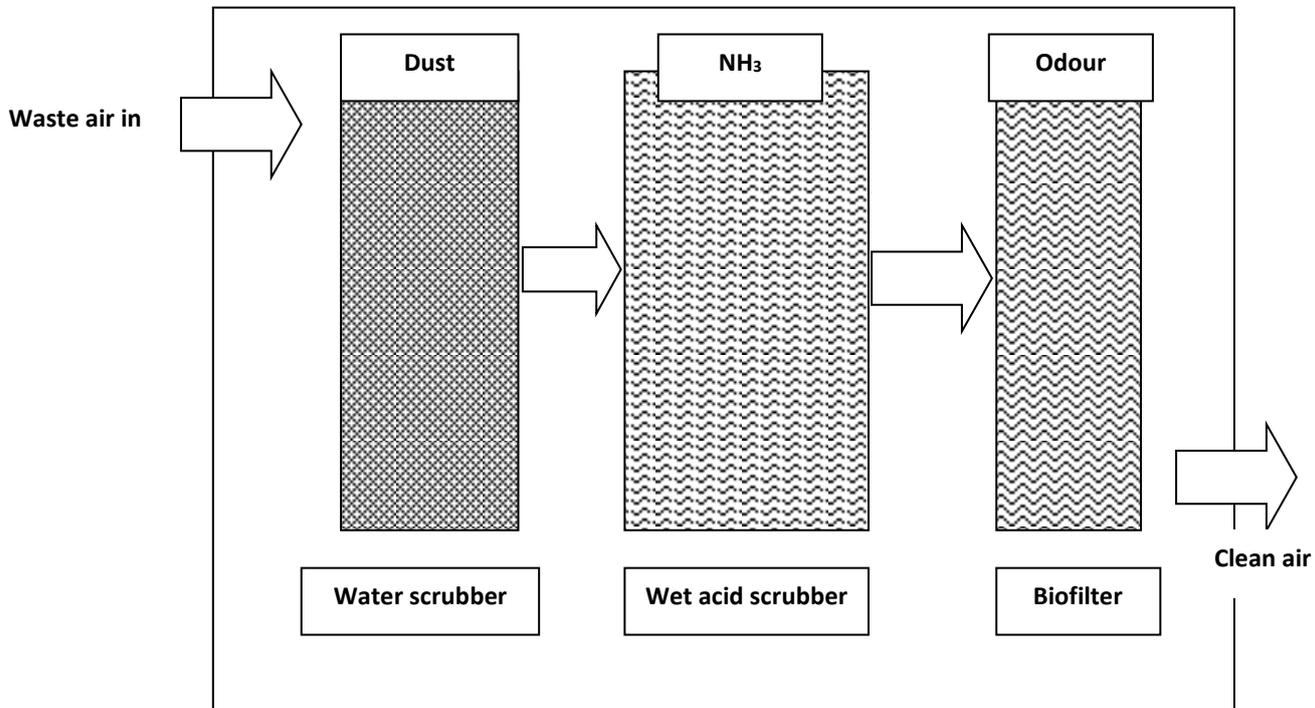


Figure 4.3 combined multi-stage scrubber: water scrubber, wet acid scrubber and biofilter

Indirect effects of ammonia emissions.

Nitrogen deposition

Nitrogen (N) deposition is the deposit of reactive nitrogen from the atmosphere both as gases (dry deposition) and in precipitation (wet deposition). Vascular plants take up most of their N through their roots but some can be absorbed via stomata (gases) or the cuticles. Non vascular plants can absorb nitrogen through their entire surface (for example lichens and bryophytes). Communities most at risk from nitrogen deposition are those rich in bryophytes and where species richness is comprised of slow growing species. Many semi-natural plants do not have the capacity to assimilate nitrogen in the presence of increased N availability (from N deposition) and can be outcompeted by plants that can (for example grass species). Such species replacements can lead to loss of specialised communities and ecosystems (APIS, 2017). Due to the high relevance the impacts of nitrogen deposition on ecosystems, it will be discussed in more detail in section 4.7.

Acid deposition

Acid deposition represents the mix of air pollutants that deposit from the atmosphere leading to acidification of soils and freshwaters. Current SO₂ contributions to acid deposition are smaller than those historically experienced so that currently, oxidised and reduced nitrogen dominate. Deposition of reduced nitrogen (N) compounds, can acidify via microbial transformations in the soil and via assimilation in plants leading to acidification of the rhizosphere (APIS, 2017). Deposition of these pollutants is usually in the form of wet deposition through rainfall or cloud-water, mist and dew, but can also include dry deposited acidifying gases. Many effects of acid deposition are indirect, associated with acid deposition lowering soil pH and increasing solubility of toxic Al³⁺ ions. Effects linked to acid deposition include leaf chlorosis, reduced decomposition rates and reduced resistance to natural processes such as freezing or desiccation events. Reproduction in both birds and plants may be sensitive to acidification and there are numerous linked effects in terms of impact to soils and freshwater. Whilst it is understood that acid deposition has a considerable impact on biodiversity, given the scope of this project the authors have chosen to focus on the impacts of nitrogen deposition and therefore acid deposition is not considered any further within this document.

Greenhouse gases (GHG) (CH₄, N₂O and CO₂)

GHG emissions from pig and poultry farms contribute to global warming. Emissions of CH₄ and N₂O from livestock production are regulated as part of the Kyoto Protocol under the United Nations Framework Convention on Climate Change. The EU reduction target for GHG is 9 % by 2008 to 2012, with reference to 1990, and with a proposed further reduction target of 20 % by 2020. Permits for individual farm projects do not contain any emission limit values for greenhouse gases. Due to lack of information they are only considered as general aspects in EIA and AA procedures for pig or poultry projects.

Dust

Dust emissions primarily give rise to problems in sensitive residential areas, but they can also be a source of impacts on biodiversity. However, there is a lack of knowledge about potential effects and the dose and effect relation of dust emissions on biodiversity. This is the reason why they are only considered as general aspects in EIA and AA procedures.

4.5 EMISSIONS INTO SOIL, GROUNDWATER AND SURFACE WATER.

In pig and poultry farms, waste water is most commonly the result of manure run off, wash water after cleaning of animals, cleaning and disinfecting of buildings and farmyards and occasionally waste water from flue-gas treatment by wet scrubbing. These emissions contain nitrates and phosphates, which contribute to eutrophication, particularly phosphates, high levels of biochemical oxygen demand and suspended solids. Waste water from the installations must be treated before discharge, and both emission limit values and subsequent monitoring conditions are normally included in permits.

Manure spreading is the key activity regarding the emissions to soil, groundwater and surface water and they include as nitrogen compounds (nitrogen cycle shown in Figure 4.4) and phosphates as main concern, but also potassium (K) and Sodium (Na), heavy metals (especially copper (Cu) and zinc (Zn)) and antibiotics and other pharmaceuticals.

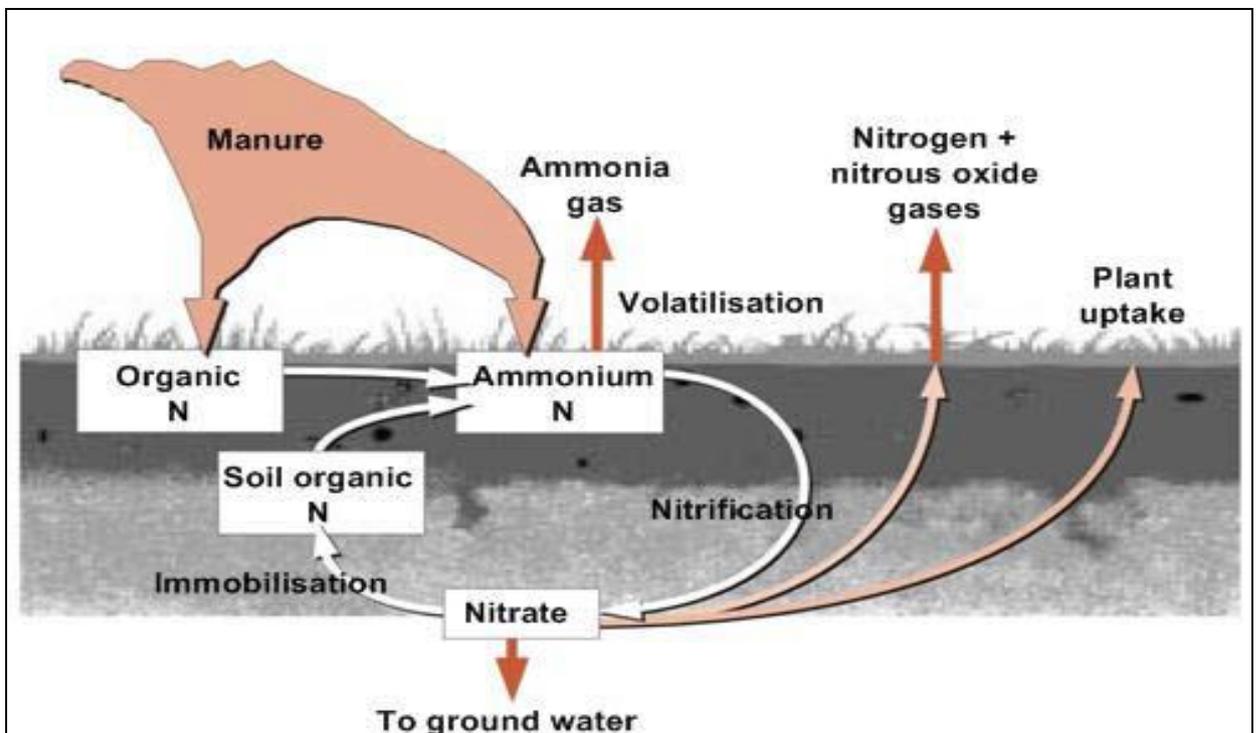


Figure 4.4: Nitrogen cycle showing the main transformations and losses to the environment
Source: [31 IRPP, MAFF 1999 = MAFF, Making better use of livestock manure on grassland, 1999]

The Nitrates Directive designates Nitrate Vulnerable Zones (NVZ) across member states which are known areas of land draining into polluted waters or waters at risk of pollution from nitrates. Within these zones, manure spreading is restricted to a maximum level of 170kg N/ha per year, although derogations are applicable under certain circumstances. Some Member States have chosen to designate their whole land mass as NVZ (Austria, Denmark, Finland, Germany, The Netherlands, Luxemburg, Ireland, Lithuania, Malta, and Slovenia, as well as the Regions of Flanders (Belgium) and Northern Ireland United Kingdom), while others (England, United Kingdom) periodically review their designated areas.

Phosphorus

Phosphates are sequestered in the soil and are less mobile than nitrogen but excess manure spreading, although complying with the limits laid down for nitrogen, can often lead to high levels of phosphorus in the topsoil. Subsequently, leachate of phosphates to surface and groundwater may follow.

Heavy metals and antibiotics

Heavy metals and antibiotics generated as a result of being generated through the food chain and subsequent manure spreading, can also become a source of impacts on biodiversity. Livestock manures, and pig slurry in particular, contain significant amounts of certain metals (Cu and Zn), mainly because they are commonly used as feed additives. Continuous application of manures to crop land can lead to the accumulation of these metals and undesirably high levels in the soil, which may pose a medium or long-term toxicity risk to plants and micro-organisms.

There is no doubt that spreading of manure causes impacts on protected sites. It may be restricted by management plans or in legal documents with which a site has got its protected status. As it was discussed earlier (see section 1.3) manure spreading being mainly an off-farm activity and not routinely included in environmental permits for farm projects it is not specifically covered in this guidance.

4.6 OTHER EMISSIONS – NOISE AND ODOUR

Pig and poultry farms can generate other emissions such as noise and odour. Noise can be an important source of disturbance for humans when installations are located close to residential areas but it can also be a source of disturbance for animal species. As shown in Table 4.1 sources of noise from pig units are associated with:

- Housing, including:
 - Methods of animal stocking and systems to remove and store manures
 - Equipment to control and maintain the indoor climate, and equipment to feed and water animals
- Unloading and loading of animals
- Manure spreading

- Milling and grinding of feed

The noise levels associated with some activities such as feeding of animals (equipment for off and on-farm transport (animals, feed, manures)) can reach significant sound pressure levels, but they usually happen inside animal housing and since the levels drop considerably outside the installations, this is a main concern specially for occupational health rather than wildlife species.

Noise impacts must be included within the appropriate assessment procedure and permits should include conditions, and where necessary, monitoring arrangements that include noise emissions. But for farm projects the conditions referring to protected animals mainly refer to the construction phase, primarily because there is a limited evidence base on which to apply noise conditions to wildlife. Much of the research undertaken on noise impacts is focused on human receptors.

Emissions of **odour** are related to a number of different compounds emitted from livestock activities such as, H₂S, although not all compounds that are involved have been identified yet. Storage of feed and dead animals may be reason for odour emissions and attract wild animals and vermin. Generally the item is believed to play a minor role in appropriate assessment procedures given the potential for impacts to flora and fauna.

4.7 IMPACTS OF NITROGEN DEPOSITION ON ECOSYSTEMS

4.7.1 OVERVIEW

Nitrogen is deposited in all manner of ecosystems via rain, fog or snow as dissolved compounds (wet deposition) or as adsorbed compounds on dust and gas particles (dry deposition).

The availability of nutrients is one of the most important abiotic factors which determine plant species composition in ecosystems. Most of the plant species in many natural and semi-natural ecosystems, especially for oligotrophic and mesotrophic habitats are adapted to nutrient-poor conditions, and can only survive or compete successfully on soils with low nutrient availability, and leading to plant communities with high species diversity.

Nitrogen is the primary limiting nutrient for plant growth in terrestrial ecosystems. As a consequence different ecosystems present with different sensitivities and vulnerabilities to enhanced levels of atmospheric nitrogen and nitrogen deposition. A large number of studies identify increased nitrogen inputs, particularly via atmospheric nitrogen deposition, as a major culprit of biodiversity loss in both terrestrial and aquatic ecosystems worldwide (RoTAP, 2006, Cleland and Harpole, 2010; Jones *et al.* 2013, Vogt *et al.*, 2013 , UNCE, 2015). (Phosphorous and potassium also have limiting functions.)

4.7.2 PROCESSES IN ECOSYSTEMS

The major impacts of nitrogen deposition on terrestrial ecosystems diversity are through the following processes:

- **Eutrophication**

Eutrophication is a process driven by the artificial or natural addition of nutrients in an ecosystem. In terrestrial ecosystems increased levels of nitrogen deposition can result in soil eutrophication, whereas in freshwater ecosystems phosphorus enrichment is one of the main drivers of the process. Long term nitrogen enrichment in terrestrial ecosystems leads to competitive exclusion of characteristic species by more nitrophilic plants, especially under oligo-to mesotrophic soil conditions (Bobbink *et al.*, 1998)

- **Acidification.**

Soil acidification is characterised by a wide variety of long-term effects. Changes in pH are dependent on the buffering capacity of the soil. In soils with higher buffering capacity (calcareous soils) the acidity increase will be a long term process whilst in soils with weak buffering capacity (non-calcareous soils with a high content of silicates), the process will be faster. As a result, plant growth and species composition of the vegetation can be seriously affected: acid-resistant plant species will gradually become dominant, and several species typical to intermediate and higher soil pH will disappear. Habitat types occurring in soils with a weak buffering capacity are most sensitive to acidification from nitrogen deposition.

- **Direct damage from ammonia**

Concentrations of ammonia over certain critical level thresholds may result in plant damage and death. Lower plants (lichens or bryophytes) are more sensitive than higher plants. As shown in section 7.2.1.4 in more detail, in the UK the following critical levels for the effects of ammonia on vegetation are applied (the critical level refers to the direct effects of a pollutant on the vegetation and ecosystems and is defined as the concentration in the atmosphere above which adverse direct effects on the receptors mentioned may occur, according to current knowledge):

- When lichens or bryophytes (including mosses, landworts and hornworts) are present a critical level of $1\mu\text{g}/\text{m}^3$ is applied.
- When lichens or bryophytes are not present a critical level of $3\mu\text{g}/\text{m}^3$ is applied.

- **Secondary stress factors.**

This relates to the exacerbation of other stresses following initial damage through direct ammonia damage and nitrogen deposition. Increased nitrogen deposition may affect plant sensitivity to factors such as drought, frost, and pathogens etc. (Bobbink *et*

al., 1998). The relationship between nitrogen deposition and plant species richness has been shown in several studies (Stevens et al., 2010), see figure 4.5 below.

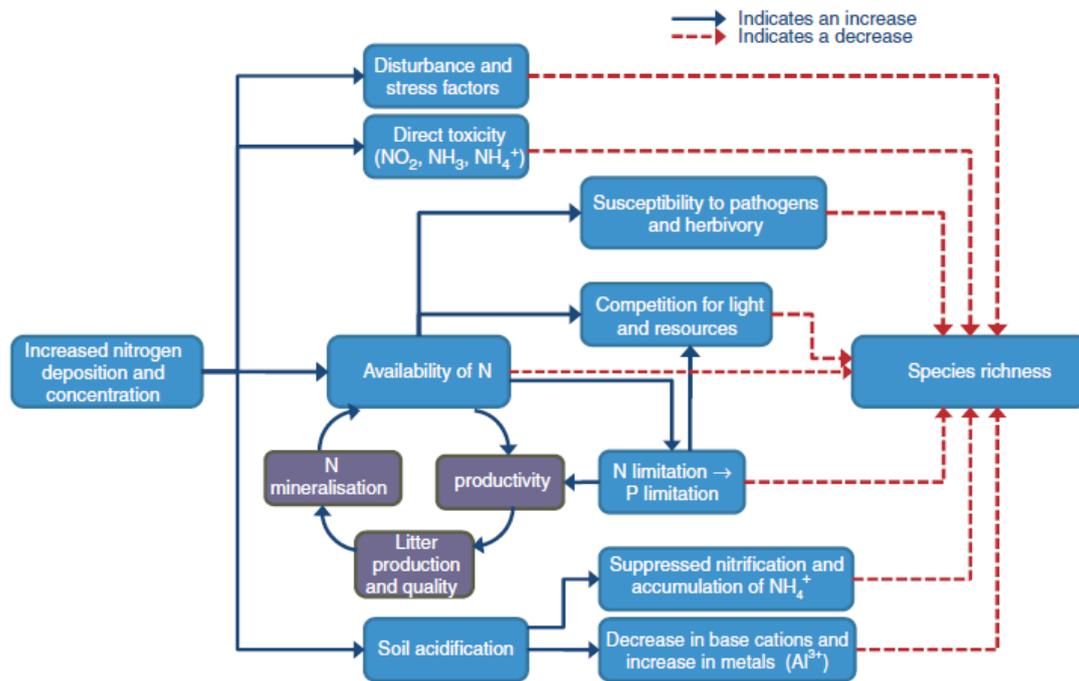


Figure 4.5: Schematic of the main impacts of enhanced nitrogen deposition on ecosystem processes and species richness. The figure is from Dise, N.B., *et al.*, (2011). Nitrogen as a threat to European terrestrial biodiversity. In: The European nitrogen assessment, ed. M. A. Sutton *et al.*, Cambridge University Press, p 467, adapted, with permission, from Bobbink R. *et al.*, (2010). Used in this guidance with permission from the author and the Cambridge University Press.

4.7.3 SENSITIVITY TO NITROGEN DEPOSITION OF PLANT COMMUNITIES AND HABITAT TYPES OF TERRESTRIAL ECOSYSTEMS.

Habitats types likely to be sensitive to eutrophication and acidification due to nitrogen deposition are those with low levels of nitrogen in soil and those with weak buffering capacity, such as coastal sand dunes, heathlands, natural and semi-natural grasslands dominated by grass species with low nutrient requirements, raised bogs and mires and fens and forests occurring on nutrient-poor soils.

Ecosystems of cold climates, including montane, boreal, tundra, subarctic, and arctic habitats, are also vulnerable to nitrogen deposition. Many of these ecosystems are dominated by bryophytes and lichens, which can be highly sensitive to direct foliar damage by nitrogen deposition (Dise *et al.*, 2011).

Another relevant aspect is the sensitivity of ecosystems to other forms of nitrogen (oxidised (NO_x) or reduced (NH_3)). The most successful nitrogen emission control policy measures in Europe have been to reduce emissions of oxidised NO_x from power plants, stationary combustion sources and transport through catalytic converters. Policies on reducing similar emissions from agriculture, mainly reduced NH_3 , have been less successful, so far (Oenema *et al.*, 2011). In some regions this can cause a shift from NO_3^- to NH_4^+ (ammonium ions) in the soil, especially in habitats with low nitrification rates (Dise *et al.* 2011). Although currently, critical loads (as explained in 2.4.3) for nitrogen deposition do not distinguish between reduced and oxidised species of nitrogen, strong evidence exists that several rare or threatened plant species of grassland, heathland, moorland, and soft-water lakes are intolerant to high $\text{NH}_4^+/\text{NO}_3^-$ ratios (Paulissen *et al.*, 2004; Kleijn *et al.* , 2008 ; Van den Berg *et al.* , 2008; Verhoeven *et al.*, 2011).

In the European context, our understanding of the impacts and of the sensitivity of ecosystems to nitrogen deposition comes almost entirely from studies in Northern Europe and North America. Outside both regions, rates of deposition within defined 34 world biodiversity hotspots were quantified using output from global chemistry transport models. For the Mediterranean Basin, the first estimates for the mid-1990s, show that the rate of deposition of 10 kg N/ha/yr, was exceeded in approximately 12% of the region; by 2050 it is estimated that it could be exceeded in 69% of the region, while in 25,4 % of the region the rate may exceed 15 kg N/ha/yr, under a business-as-usual scenario (Phoenix *et al.* , 2006). The deposition rates of 10 and 15 kg N/ha/yr were chosen because they are consistent with the lower and middle range of critical loads set for European terrestrial ecosystems of low nutrient status (Bobbink *et al.*, 2003).

4.7.4 FAUNA AND NITROGEN DEPOSITION.

Research has in recent years, greatly improved our understanding of the direct effects of nitrogen deposition on ecosystems - with a particular focus on the effects in plant communities. Less attention has been directed toward how nitrogen deposition may affect ecosystems indirectly by modifying the interactions among organisms. Empirical evidence suggests that there are several mechanisms by which nitrogen deposition may affect interactions between plants and insect herbivores. The most likely mechanisms are deposition-induced shifts in the quality and availability of host plant tissues (Throop and Lerdau, 2004). Other research postulates that there could be effects on vertebrates, as in the case of the red-backed shrike (*Lanius collurio*) in the coastal dunes of the Netherlands (Esselink *et al.*, 2007).

4.7.5 THREATS AND PRESSURES ON NATURA 2000 SITES FROM PIG AND POULTRY FARMS PIGS. THE APPROACH HABITATS DIRECTIVE ARTICLE 17 ASSESSMENT REPORT

4.7.5.1 PRESSURES AND THREATS

Part of the Article 17 assessment includes listing the pressures to current structure and function and threats to the future prospects. A list of pressures and threats is available on the Article 17 Reference Portal²³ which was proposed for the assessment of conservation status under this Article of the Habitats Directive for the period 2007-2012, as well as guidance on prioritisation. Pressures and threats are classified in four levels.

The threats and pressures are under 17 headings and has 75 categories at the 2nd hierarchical level, e.g. A01 Cultivation. However, Member States or users who need more precision can use 3rd level and 4th level categories. Those which could be related to pig and poultry farms could be listed as following:

- Agriculture (A):
 - Modification of cultivation practices (A.02)
 - Agricultural intensification (A.02.01)
 - Agricultural change (A.02.02)
 - Livestock farming and animal breeding (without grazing) (A.05)
 - Animal breeding (A.05.01)
 - Stock feeding (A.05.02)
 - Fertilization (A.08)
- Pollution (H)
 - Pollution to surface waters (limnic & terrestrial, marine & brackish) (H.01)
 - Other point source pollution to surface water (H.01.03)
 - Diffuse pollution to surface waters due to agricultural and forestry activities (H.01.05)
 - Pollution to groundwater (point sources and diffuse sources) (H.02)
 - diffuse groundwater pollution due to agricultural and forestry activities (H.02.07)
 - Air pollution, air-borne pollutants (H.04)
 - Nitrogen-input (H.04.02)
 - Other air pollution (H.04.03)
 - Excess energy (H.06)
 - Noise nuisance, noise pollution (H.06.01)
 - Point source or irregular noise pollution (H.06.01.01)
 - Diffuse or permanent noise pollution (H.06.01.02)

The period 2007-2012 report includes the graphic shown on Figure 4.6. It reflects the frequency of high ranked level 1 pressures and threats for terrestrial ecosystems. Agriculture is one of the highest frequent level 1 pressure & threat.

²³ http://bd.eionet.europa.eu/activities/Reporting/Article_17/reference_portal.

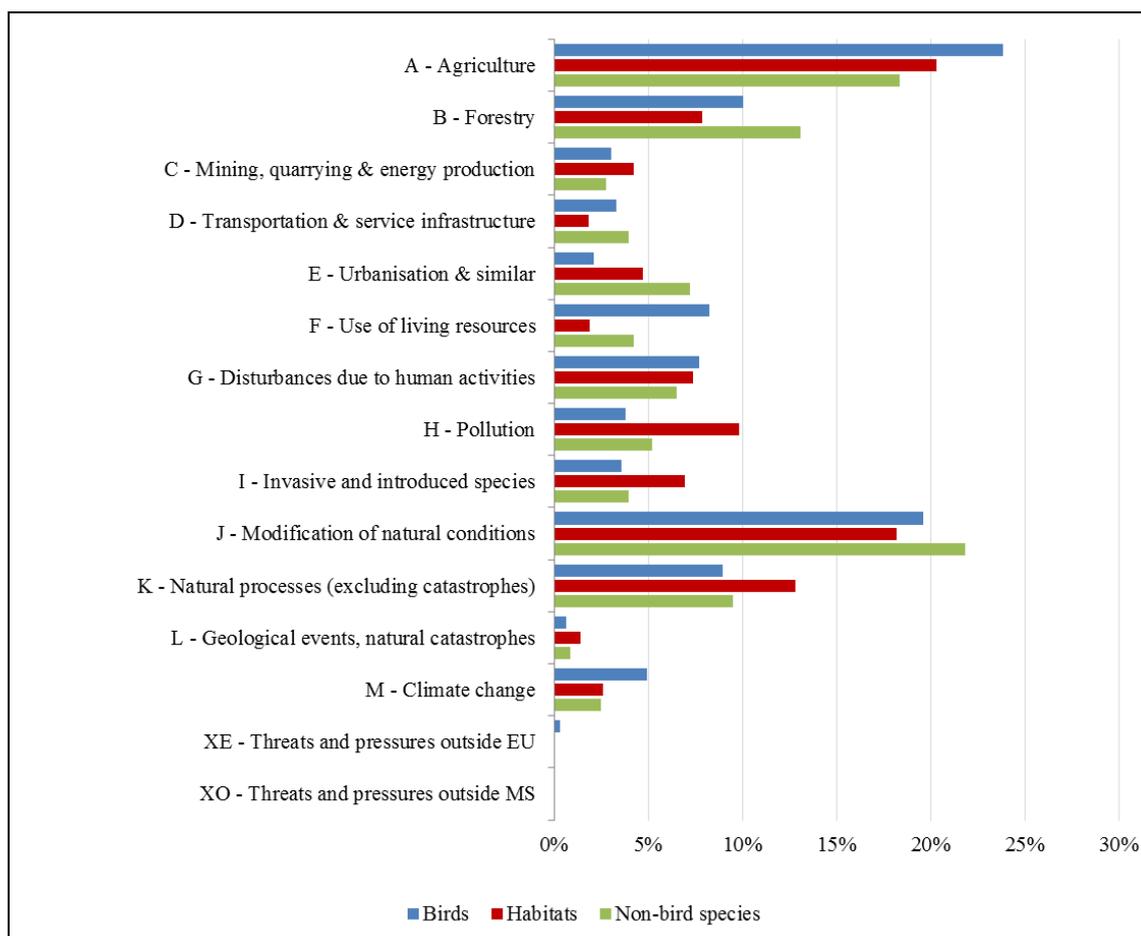


Figure 4.6 — Frequency (%) of high ranked level 1 pressures and threats (together) Terrestrial. Source: The State of Nature in the EU. Report under the EU Habitats and Birds Directives 2007-2012. European Commission

Related to the potential impacts of pig and poultry farms, nitrogen input from air-borne pollutants is included in the list. In addition, the reporting of pressures and threats includes a category for a “pollution qualifier”. This allows a pollutant, from a specified list, including nitrogen input, to be included as a qualifier for other pressures/threats, for example, which have an indirect pollution effect (e.g. some of the pressures/threats under ‘livestock farming and animal breeding (without grazing)).

It can be therefore concluded that nitrogen deposition is an important pressure and threat for Annex 1 habitats, particularly in North-West Europe and the exceedance of critical loads for nitrogen is a useful tool to assess the conservation status of the habitat types of Annex I as provided in the Article 17 of the Habitats Directive. It could also be a tool to assess the effects of pig and poultry farms on Natura 2000 sites.

4.7.5.2 NITROGEN CRITICAL LOADS EXCEEDANCE IN THE FRAMEWORK OF THE HABITATS CONSERVATION STATUS ASSESSMENT OF ARTICLE 17 OF THE HABITATS DIRECTIVE.

A key policy tool for mitigating nitrogen pollution has been the critical load of nitrogen input, calculated based on fertilisation experiments and observations along gradients of nitrogen pollution (Sutton *et al.*, 2011; Payne *et al.*, 2012). Critical loads have also been defined for eutrophication of terrestrial ecosystems, for heavy metal pollution of terrestrial and surface water ecosystems, as well as for the eutrophication and the acidification of aquatic ecosystems.

Methods for assessing nitrogen deposition impacts on ecosystems are being developed by scientific groups established under the United Nations Economic Commission for Europe (UNECE) Convention on Long-Range Transboundary Air Pollution (CLRTAP). These methods, based on critical loads, are used to inform policy development under the Convention (e.g. the revision of the Gothenburg Protocol) and also support the assessments under NECD. Using nitrogen critical loads exceedance in the habitats conservation status assessment framework of Article 17 of the Habitats Directive has been recommended. Guidance for conservation status assessment under Article 17 reporting for the period 2007-2012 does not give detailed information on nitrogen deposition assessment, but refers to other sources, including guidelines produced by the Coordination Centre for Effects (CCE) and more information which can be found in Hettelingh *et al.*, (2009). The CCE is the Programme Centre of the International Cooperative Programme on Modelling and Mapping of Critical Levels and Loads and Air Pollution Effects, Risks and Trends (ICP M&M). ICP M&M is part of the Working Group on Effects (WGE) of the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP Convention).

The use of empirical critical loads for nutrient nitrogen is proposed in 'Review and revision of empirical critical loads and dose-response relationships. Proceedings of an expert workshop, Noordwijkerhout, 23-25 June 2010'²⁴, since these are derived from empirical evidence of effects, of nitrogen deposition on habitats. They are related to the concept of habitat structure and function e.g. species change, biogeochemical function. Tables with critical loads for different habitat types are included.

In the tables, the EUNIS (European Nature Information System) ecosystem classification is used. A correspondence table with the habitat types of Annex I of the Habitats Directive is included in the document.

England, the Netherlands and Denmark have each used empirical nitrogen critical loads to make assessments of the potential impacts on Special Areas of Conservation and/or conservation status. In Germany, the guidance for road construction projects issued by Federal for Agency for Road Construction proposes the use of modelled critical loads for the assessment of impacts of nitrogen deposition on Natura 2000 sites arising from traffic.

In the Alterra report 2397 on "Overview of critical loads for nitrogen deposition for Natura 2000 habitat types occurring in the Netherlands" (H.F. van Dobben, R. Bobbink, D. Bal en A.

²⁴ Bobbink and Hettelingh (eds.), 2011 available at <http://www.b-ware.eu/sites/default/files/publicaties/Review-revision-empirical-critical-loads-2011.pdf>

van Hinsberg, 2014²⁵) an overview of empiric and simulated critical load values for nitrogen deposition is presented for the Natura 2000 habitat types that occur in the Netherlands, and additionally for other nitrogen sensitive habitats of the species protected in Natura 2000 sites.

Based on critical loads for nitrogen, in the report, sensitivity classes for the habitat types are established, as stated in Table 4.4:

Table 4.4: sensitivity classes based on critical loads for nitrogen

Sensitivity Class	CL Mol N/ha/year	CL kg N/ha/year	Colour code
Highly sensitive	< 1400	20	red
Sensitive	≥ 1400 - < 2400	≥ 20 - < 34	amber
Non-sensitive	≥ 2400	≥ 34	green

The Danish approach can be found in NERI Technical Report No. 647, 2007. 'Criteria for favourable conservation status in Denmark'. Natural habitat types and species covered by the EEC Habitats Directive and birds covered by the EEC Birds Directive'. For habitat types, critical loads for nitrogen deposition in kg/ha/year UNECE 2003 are used to assess the habitat structure and function of the area. For example, for the Annex I of the Habitats Directive habitat type 7110 - *Active raised bogs, the following criteria for the assessment of the conservation status regarding nitrogen deposition are set in Table 4.5.

Table 4.5: Criteria for the assessment of the conservation status regarding nitrogen deposition for habitat type 7110

Type 7110	Property	Unit of measurement	Criteria	Comments
Structure and function	Naturally low nutrient level	Nitrogen deposition (kg/N/hectare/year)	Nitrogen deposition should not exceed the level laid down	Critical load 5-10 kg/N/year, UNECE 2003

Source: NERI Technical Report No. 647, 2007

4.7.5.3 METHODOLOGY PROPOSED FOR CRITICAL LOADS BASED NITROGEN DEPOSITION ASSESSMENT FOR HABITATS DIRECTIVE ARTICLE 17 REPORTING

The method is proposed in 'Critical Loads based nitrogen deposition assessment for Habitats Directive Article 17 reporting' (Whitfield, Hettelingh and Hall, 2013). It includes the following steps:

- Step 1: Applying critical loads of nitrogen deposition from Bobbink and Hettelingh 2011 to Annex I of the Habitats Directive habitats.
- Step 2: Mapping critical loads.

²⁵ 'Overzicht van kritische depositiewaarden voor stikstof, toegepast op habitattypen en leefgebieden van Natura 2000'

- Step 3: Obtain and map available nitrogen deposition data for the most recent year available and if available a future scenario e.g. 2020. (At the European level, estimates of deposition are available through EMEP²⁶)
- Step 4: Generate exceedance estimates
- Step 5: Record nitrogen deposition as threat to future prospects

4.8 IMPACTS OF PHOSPHORUS EMISSIONS.

Although both nitrogen and phosphorus can be growth-limiting nutrients in both aquatic and terrestrial ecosystems, the primary productivity of freshwater ecosystems is more often limited by phosphorus than by nitrogen, whereas the opposite is normally the case in terrestrial ecosystems.

4.8.1 IMPACTS IN TERRESTRIAL ECOSYSTEMS.

Phosphorus emissions to terrestrial ecosystems have received less attention than nitrogen emissions, although some studies have indicated that phosphorus pollution may be detrimental for biodiversity as well (Ceulemans *et al.*, 2014). Nitrate is readily leached from soils, whereas phosphate has a movement rate through soil that is orders of magnitude slower. Therefore, freshwaters exhibit a chemistry that reflects inputs that erode or leach from surrounding terrestrial habitats, whereas terrestrial soils have a chemistry reflecting the compounds that remain in the soil; soils thus are typically relatively nitrate poor and phosphate rich.

The input of phosphorus to terrestrial ecosystems comes mainly from the application of mineral fertilisers and manure in nearby agricultural areas via runoff of excess fertiliser (Vance *et al.*, 2003; Peñuelas *et al.*, 2012, 2013; Ceulemans *et al.*, 2014). Airborne mineral phosphorus aerosols play also a role (Peñuelas *et al.*, 2012).

Phosphorous is known to be highly persistent in the soil. Consequently, even low levels of phosphorus inputs can be damaging in the long term through cumulative effects (Ceulemans *et al.*, 2014).

Although eutrophication in terrestrial ecosystems is mainly driven by nitrogen deposition, phosphorus deposition contributes also to the process. Eutrophication by phosphorus happens mostly in phosphate sediments, where the phosphates stored in the past are slowly released to result eutrophication. Areas that are flooded with phosphate-rich water will also suffer eutrophication. Eutrophication by groundwater can also take place in terrestrial ecosystems fed by groundwater, as in fens, although in some of them surface water and direct rainfall also play a role (McBride *et al.*, 2011). Fens are wetlands characterized by high soil water levels for all or part of the year. As water is the key carrier for nutrients entering or leaving fens, the nutrient regime is closely linked to hydrological regime as well as to land management

²⁶ http://webdab.emep.int/Unified_Model_Results/AN/.

practices on adjacent land (McBride *et al.*, 2011). The mesotrophic fen meadows (*Cirsio dissecti-Molinietum* association)²⁷ in the Netherlands and in other North-western European countries, which are of high biodiversity value, are seriously threatened by desiccation, acidification and eutrophication (Lamers *et al.*, 1997 ; Jansen *et al.*, 2000).

4.8.2. IMPACTS IN AQUATIC ECOSYSTEMS.

The major impacts of phosphate deposition on aquatic ecosystems diversity are through the following processes:

Freshwater ecosystems eutrophication.

Freshwater ecosystems eutrophication is the main environmental concern related to phosphorus deposition, since excessive concentrations of phosphorus is the most common cause of eutrophication in freshwater lakes, reservoirs, streams, and headwaters of estuarine systems across the EU?. The results are excessive production of autotrophs, especially algae and cyanobacteria. This high productivity leads to high bacterial populations and high respiration rates, leading to hypoxia or anoxia in poorly mixed bottom waters and at night in surface waters during calm, warm conditions. Low dissolved oxygen causes the loss of aquatic animals and release of many materials normally bound to bottom sediments including various forms of phosphorus. This release of phosphorus reinforces the eutrophication.

Eutrophication of other aquatic ecosystems.

In the ocean, nitrogen becomes the key mineral nutrient controlling primary production. Estuaries and continental shelf waters are a transition zone, where excessive phosphorus and nitrogen are pollutants.

²⁷ Semi-natural grasslands known as 'Blauwgraslanden' in Dutch; they are included in the Annex I of the Habitats Directive as the habitat type 'Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)', which corresponds with the Natura 2000 code 6410.

5 THE IMPORTANCE OF STRATEGIC PLANNING AND LAND USE PLANNING IN THE DEVELOPMENT OF LIVESTOCK FARM PROJECTS

5.1 STRATEGIC PLANNING

Strategic planning is a useful supporting tool for competent public bodies that have to establish a coherent sustainable development plan for their municipality, region or country. Depending on the laws and planning systems in the individual countries and on the different levels – national, regional or local - spatial planning requires the examination of the different demands on the land across a broad geographical area. An integrated development strategy allows the identification of win-win situations and the minimisation of conflicts. This includes taking into account societal and environmental concerns very early in the planning process. In addition, the process generally includes the step of public consultation in which interest groups, the general public and different economic sectors can contribute to the decision making process.

The plans will be subject to a Strategic Environmental Assessment (SEA) under the SEA Directive and, where they are likely to significantly affect one or more Natura 2000 sites, an appropriate assessment under the Habitats Directive will also be required. The assessments examine the extent and potential negative effects on the environment and explore viable alternatives. Thus they support the identification of conflict situations and provide possibilities for resolving conflicts early on in the planning process.

5.2 STRATEGIC PLANNING AND PIG AND POULTRY FARMS

Rearing of pigs and poultry is an old and vital part of agriculture in all Member States. Due to historical development farms are often concentrated in small villages or located as single farms across wider parts of the countryside. New pig and poultry farms are often planned close to already existing farms, and as the size of farm projects has changed during the last few decades, odour, dust and noise emissions are no longer being tolerated by neighbouring populations and therefore conflicts are not unusual.

Pig and poultry farms - especially those spread across the countryside - are often situated in the vicinity of or in Natura 2000 sites. The Habitats Directive does not prohibit the operation of already existing farms and building up new installations in or near Natura 2000 sites. The operation of both large and small pig and poultry farms can negatively affect the conservation status of natural habitats and species of community interest.

The legal background concerning strategic spatial planning and pig and poultry farm projects is different across Member States.

German example

In Germany, the Federal Regional Planning Act obliges the federal states (Länder) to establish a development plan for their territory. This is done according to the State Planning Acts of the

states through state development plans (Landesentwicklungsgesetz) and regional development plans (Regionalplan/Raumordnungs-plan). The content of the regional development plans generally is:

- system of central locations / cities
- structures for settlements and free areas
- definition of development axes
- priority and preserved areas for important / significant uses
- locations and routes for infrastructure.

The outcomes of such development plans are binding, and a more detailed planning scope in form of preparatory land-use plans and binding land-use plans is carried out later by the rural districts (Kreise) and the administration of the municipalities (Gemeinde).

Under certain conditions farmers may also have 'privileged status'. If the farmer has enough acreage of land for producing more than half of the feed for their own animals they fall within this status. (Permit authorities must check this.)

Activities having this privileged status are permissible in the undesignated outlying areas (areas at the outlying parts of villages and outside villages) where there are no conflicting public interests and ample public infrastructure provision can be guaranteed (§ 35 Federal Building Code). For these projects the planning is already done by law. For commercial / industrial pig and poultry farms a legally binding land-use plan is necessary, but this applies to a minority of farm projects.

Due to the privileged status potential conflicts of the individual farm with the requirements of the Habitats Directive concerning Natura 2000 sites sometimes present themselves late in permitting procedures. Therefore it is highly recommended that the project bearer or his consulting project planner should contact the competent authorities at a very early stage of the development of permit applications.

6 DOCUMENTS AND DATA TO BE SUBMITTED TO THE COMPETENT AUTHORITY FOR PERMITTING

6.1 DIFFERENCE BETWEEN SCREENING AND APPROPRIATE ASSESSMENT

The main difference between the two steps is a level of detail - in terms of the quality of the documents and data needed to suffice the two procedures, screening and appropriate assessment, as illustrated in Table 6.1.

Screening

Screening is a way in which one can determine, in a cost-efficient manner and at an early stage, whether an appropriate assessment is necessary. In some cases a few changes to the project at the screening stage may well help to prevent an outcome of likely significant effects early on in the process. In the screening phase, a wide interpretation of the term 'project' and a strong application of the precautionary principle (ECJ C-127/02) are necessary to assure the process. Following this provision, one must balance the worst case impacts with the most sensitive habitats and species.

On the basis of objective information, it must be possible to conclude that significant effects on the site will not occur. Screening normally means an estimation by using available data, generally accepted information and experiences. It must always be done on a case by case basis and the outcome must be beyond scientific doubt. If doubts remain, an appropriate assessment must always be carried out.

For screening it is necessary to consider the following aspects for assessment:

- Distance / location in relation to the Natura 2000 sites
- Identification of the worst case scenario in terms of the project
- Examination of the conservation objectives for the Natura 2000 site - especially those of the most sensitive parts (worst case scenario)
- Consideration of the potential effects of the project on the Natura 2000 site (in view of the conservation objectives) both alone and in-combination
- Application of the precautionary principle and prevention
- Identification of likely significant effect
- Documentation and recording of the screening result for audit purposes

Appropriate assessment

The objective of appropriate assessment is to determine whether the impacts of a plan or project might result in adverse effect on the site integrity of a Natura 2000 site. The potential impacts of the project and the sensitivity of habitats and species within the Natura 2000 site towards these impacts must be identified. Scoping can support decision making as to which

details have to be investigated within the affected area, and assist in the following data collection.

Investigations generally include (European Commission, 2001):

- Identifying habitats and species which are protected by conservation objectives
- Collecting real-time data on favourable conservation status of qualifying features
- Mapping the extent of pollutant exceedences and location of qualifying features within the affected area
- Identification of qualifying features sensitive to pollutants being assessed (for example nitrogen or acid sensitive species)
- Designing appropriate mitigation measures to avoid impacts at their source
- Assessing the significance of the remaining effects to determine adverse effect

The key issue, both in screening and in appropriate assessment is that of a correct interpretation of 'significance'. The term 'significance' is not defined in the Habitats Directive, and this can lead to difficulties and heterogeneity in practice. To aid this clarification, a definition of thresholds for the assessment of impacts and their significance would be helpful, and some member states have considered this possibility. Methodological guidelines and standards are also important for advice, support and a high quality of assessments produced, for reduction of efforts and costs and for legal certainty.

Table 6.1: Differences between screening and Appropriate Assessment

Screening	Appropriate Assessment
Investigates if <u>in principle</u> (significant) effects on a site <u>MIGHT occur</u>	Investigates if <u>significant</u> effects on essential features / elements <u>CAN occur</u>
Is carried out generally as <u>rough estimate</u> based on existing documents and background data on potential impacts (e.g. N deposition), general information resp. accepted values from experience	Based on <u>detailed assessments</u> , which generally include mapping of flora and fauna and information pertaining to individual cases
Significant effects must be excluded <u>without any reasonable doubts (certainty)</u> , otherwise appropriate assessment is necessary	Significant effects must be excluded <u>without any reasonable doubts (absolute certainty)</u> , otherwise the project is inadmissible or approved only in exceptional circumstances (6.4 Habitats Directive)
Threshold of <u>relevance</u>	Threshold of <u>significance</u>
Mitigation measures generally <u>not yet</u> taken into consideration	Mitigation measures are <u>fully</u> integrated in the appropriate assessment

Source: Derived from: Dirk Bernotat, presentation 'Die Verträglichkeitsprüfung im Kontext anderer Planungsvorhaben' [https://www.bfn.de/fileadmin/MDb/documents/service/11-04-07_Bernotat_BfN_FFH-VP.pdf]

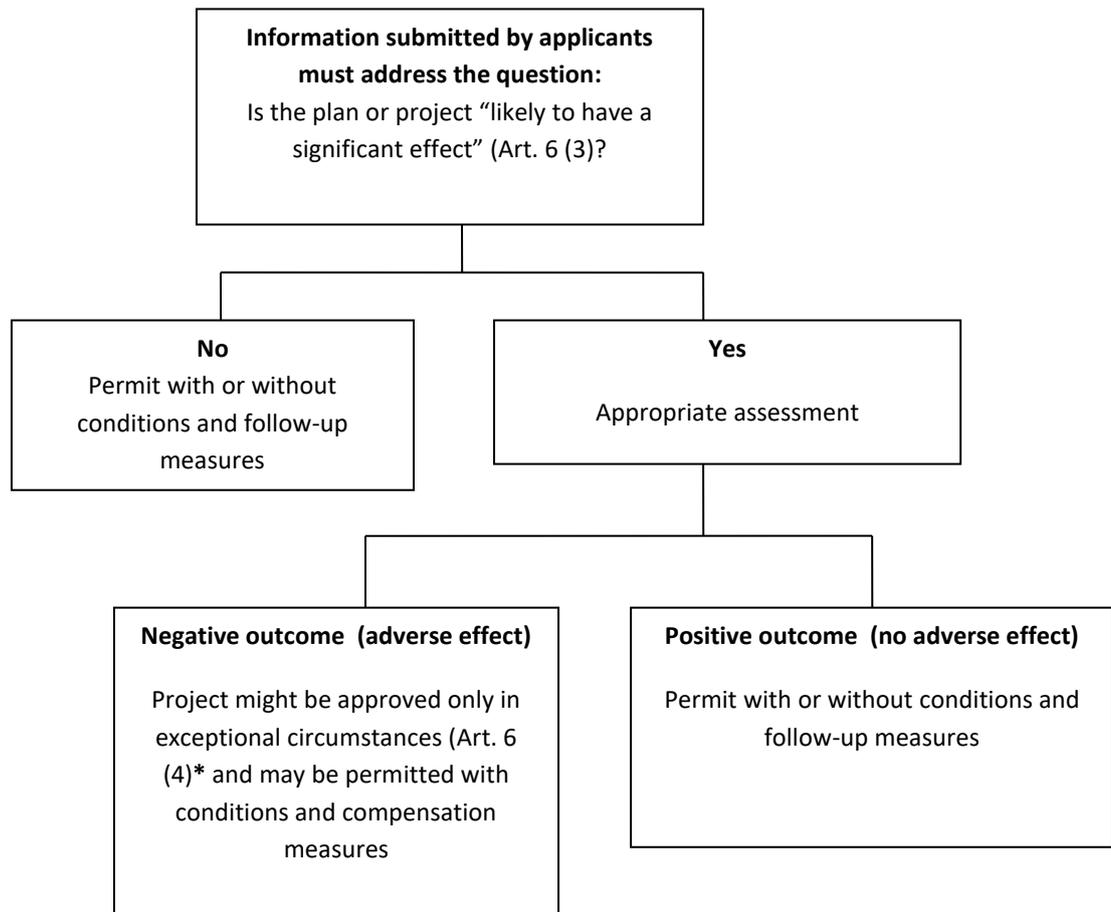
6.2 APPLICATION DOCUMENTS, DATA AND OTHER REQUISITES

For the purpose of screening, the applicant must submit detailed information about the plan or (integrated) project, as well as its (potential) effects on the habitats and species to be protected. This will allow competent authorities to evaluate whether there is a 'likely significant effect', considering the need to avoid deterioration of natural habitats and the

habitats of species as well as disturbance of the species for which the areas have been designated.

If the evaluation shows that ‘no likely significant effects’ occur, competent authorities may issue a permit which has conditions and follow-up monitoring measures, without previously submitting that plan or project to an appropriate assessment. A permit is also issued after a positive decision (no adverse effect on site integrity) at the appropriate assessment stage. In cases where the appropriate assessment has a negative decision (adverse effect on site integrity), the Habitats Directive Article 6(4) procedure is unlikely to apply for pig and poultry farm projects because it is unlikely that the project will meet the test of ‘imperative reasons of overriding public interest’ – however, consideration of the derogation tests must be completed to ensure that every opportunity is afforded the applicant to gain a permit where possible. (see Figure 6.1).

Figure 6.1 Permit procedures following of Article 6.3 and Art. 6.4 of the Directive for permit procedures



* only for a limited number of industrial activities this seems to be an option (e.g. for power plants), Specific cases in which the Article 6.4 was applied in Spain for the enlargement of airports, construction of sea ports, construction of dams and water supply systems, construction of railways, roads and other linear infrastructure, construction of electric power high-voltage transmission networks. IROPI has not been applied in the case of farm projects or power plants so far in Spain. In Germany It has been applied for a power plant project but not for farm projects.

For the purpose of assessing the effects of industrial projects on Natura 2000 sites, the main characteristics of projects and plans, especially the proposed emissions and its effects on species and habitats must be considered. Member states may specify the information needed in more detail within those features, and the Environmental Impact Assessment report may include all the relevant information that is needed for the appropriate assessment. On this basis, member states may use this information in applications requiring Habitats Directive screening or the appropriate assessment to reduce duplication and workload for the applicant.

For the appropriate assessment, information obtained in Phase 2 of this project report on 'Nature protection in permitting and inspection of industrial installations – Implementation of Art. 6(3) of the Habitats Directive'²⁸ indicated that the following information is expected to be in the application:

- **General description of the plan / project:** characteristics of the installation, description of effects during the phase of building and the phase of operation (land take / consumption, emissions into soil, water and air, extent of the excavation works, transportation demands, the dimensions of the construction, operation or decommissioning; changes in an existing installation that must be evaluated; information concerning proponents such as contracts and the majorities for the determination of the boundaries of the project.
- **Emissions arising from the plan / project:** Type, timing (whether continuous or intermittent), direct and indirect sources, and amounts of emissions into air, land and water and amounts (calculated by modelling) and environmental quality monitoring (air, water, etc.).
- **Distance from Natura 2000 sites:** Distance(s) of the project to the Natura 2000 site(s) within the area of impact of the installation and those close to it (with no. and official name of the sites), the protection objectives, natural resources requirements.
- **Description of potentially affected Natura 2000 site areas:** for each of the protected natural habitat types and species (priority / non-priority), the current state, the conservation targets and development objectives, the sensitivity of habitats and species against the effects of the project and the existing loads e.g. of nitrogen compounds.
- **Status of qualifying features of species and habitats:** Status of qualifying features (priority and non-priority species and habitats) within the area of impact of the installation, the current state, the conservation targets and development objectives, the sensitivity of habitats and species against the effects of the project the existing loads (e.g. of nitrogen compounds).

²⁸ Available at <http://www.impel.eu/wp-content/uploads/2015/11/FR-2014-14-Nature-protection-in-permitting-and-inspection-of-industrial-installations.pdf>

- **Description of potential effects:** Description of possible (direct and indirect/short and long term/reversible and irreversible) effects of the project within Natura 2000 sites, on natural habitats and species.
- **In combination potential:** General description of other plans / projects which might have direct or indirect effects on the Natura 2000 sites together with the plan/project under analysis.
- **Cumulative effects with other plans and projects:** description of possible (direct and indirect) effects of the project in combination with other projects – on the protected site and the natural habitat types and species.
- **Mitigation:** Proposed mitigation measures.
- **Long term follow-up:** Plan of follow-up measures.

For the appropriate assessment detailed information has to be submitted on each of the above, and in cases where the applicant undertakes the appropriate assessment themselves, an overall statement concerning the significance should also be submitted. The overall decision as to whether there is or is not, likely significant / adverse effects is made by the competent authority and in some member states the assessment of likely significance and (where necessary) appropriate assessment is wholly completed by the competent authority (for example England), even though the appropriate detail to make that decision is submitted by the applicant.

For screening, the first four points above are the same as for the appropriate assessment but with somewhat less detail. If screening indicates that pollutants and subsequent hazards will not have an impact upon the Natura 2000 site, the assessment is finished with the conclusion that there are no likely significant effects and the permit may be granted (subject to other permitting requirements). If screening concludes a likely significant effect, and that some pollutants and subsequent hazards may have an impact on the Natura 2000 site, an appropriate assessment must be carried out.

Normally there is no differentiation between normal and integrated projects (including mitigation measures), besides the eventual additional monitoring information. 'Integrated project' means that the project includes measures to avoid significant effects on nearby Natura 2000 sites from the very beginning. There are also no significant differences between the application requirements for new or existing installations. For variations to an existing installation, only the difference between the situation at the date of notification of the Natura 2000 site and the new situation is relevant for the estimation of the effects on the Natura 2000 site and for establishing further permit conditions.

Where possible competent authorities should supply the best information available within their organisations for carrying out the appropriate assessment, such as the location of habitats, species and the levels of exposure appropriate to those habitats and species. This

data may not always be held by the competent authority, and in these cases the applicant should be directed to the relevant alternative sources of information (for example in England, this may be through local records centres or local authorities).

The proponent should be responsible for the relevant information and this must be supplied by (certified/accredited) experts (for example licensed or experts in species surveys).

In some countries operators need also to include in their application further information, such as the air abatement techniques. Examples of best practice across member states are detailed in Table 6.2 below, and further explored [on](#) chapter 7.

Table 6.2: Examples of best practice services provided by member states (air pollution control)

Germany

In Germany some federal states (Länder) force operators to plan IED pig or poultry farms with scrubbers.

Scotland

The Scottish Environment Protection Agency (SEPA) carries out the monitoring, assessment and regulation of the effects of atmospheric emissions on habitats, using the Simplified Calculation of Ammonia Impact Limits (SCAIL) Project, especially to assess pig and poultry installations. They also use the UK Air Pollution Information System (APIS). APIS is a searchable web database that incorporates available research on air pollution and its environmental impacts. http://www.sepa.org.uk/air/process_industry_regulation/habitats/apis.aspx

Netherlands (including the AERIUS tool)

In The Netherlands IED farm projects generally have to be neutral concerning the nitrogen balance. Consequently the installations for intensive rearing of pigs and poultry are already planned with abatement devices such as air scrubbers (air cleaning system).

AERIUS calculates both nitrogen emissions and deposition levels for nature areas, including Natura 2000 sites, caused by new or expanding economic activity. Once the PAS (Dutch intergrated approach to nitrogen) has been implemented, project proponents will be legally obliged to use AERIUS to calculate the nitrogen impact of their projects. The calculation results then serve as the foundation for permit applications, to comply with the Nature Conservation Act 1998. This applies to all nitrogen emitting sectors: agriculture, industry, and traffic & transport. In the case of pig farms, it calculates the ammonia and nitrogen oxide emissions levels on the basis of animal category and the number of animals within the housing systems; subsequently spatial dispersion of the emissions and the deposition locations are calculated.

England

The Environment Agency provides two upfront services for intensive farmers to help them to make an assessment of their impacts ahead of submitting an application. The nature and heritage conservation screening service will identify if there are any Natura 2000 sites relevant to the proposed activity. Where there are, the authority will provide a map of the designated site locations and an information pack explaining how assessments should be undertaken and where applicants can get further advice and

help.

The second service is the Ammonia Screening Tool (AST) which was developed internally, and allows the competent authority to determine whether there will be a need for the applicant to undertake detailed modelling as a result of a simplified calculation which approximates ammonia, nitrogen deposition and acid deposition figures for the proposal.

6.3 DETERMINATION OF THE AREA IN WHICH IMPACTS / EFFECTS MAY OCCUR

The area of the Natura 2000 site in which effects from a project may occur depends on the type of impact, with the most far-reaching impacts determining the area assessed. In case of pig and poultry farms with forced air cooled stables (forced ventilation) the ammonia emissions are a key factor.

Different member states manage assessment of area in different ways. The Environment Agency in England uses a standard screening distance of 10km for intensive farm projects with Natura 2000 sites. Screening distances will be different for other nationally designated sites such as Sites of Special Scientific Interest (SSSI) and locally designated sites such as local wildlife sites and ancient woodlands. Screening distances will also differ depending on the activity being applied for – for example a pig or poultry farm will have different screening distances for Natura 2000 sites, SSSI and local sites than those for activities such as landfill or incinerator. Distances are pre-agreed with the relevant nature conservation body and are based on a pre-determined generic risk assessment considering sensitivity, likelihood of effects and pollutants involved.

In Germany a proposal for a case by case decision is made by using a general formula for smaller installations and modelling for big installations (detailed information see chapter 7).

6.4 TEMPLATES FOR PREPARING THE APPLICATION DOCUMENTS (SEE ALSO ANNEX I)

As a general recommendation for all sectors, the 'EC Study on evaluating and improving the Article 6.3 permit procedure for Natura 2000 requirements under Article 6.3 of the Habitats Directive 92/43/EEC' (2013) identified among other things, that

- Special attention should be given to encouraging early dialogue, planning and working in partnership - for example at the pre-application stage – and between authorities
- Promoting a more strategic approach to take into account of Natura 2000 early on
- Providing more targeted, user-friendly guidance, forms and checklists for the various stages of the appropriate assessment

Most member states highly recommended having pre-application discussions on the individual project and to address the Natura 2000 sites issue. This guarantees that necessary documents are submitted early, so that decisions can be made at an early stage in the procedure avoiding extra costs and time delay. Authorities provide guidance on documents and data needed for the application, forms and templates to be filled in. In some cases, the application can be uploaded onto an authorities homepage, however this cannot replace the face to face

discussion during which aspects of the project may be addressed that the applicant may not have considered.

Different member states manage pre-application in different ways. In England, pre-application discussions are not obligatory but are highly recommended by the Environment Agency. The Environment Agency can provide up to 15 non-chargeable hours which will include the carrying out of a nature and heritage conservation screening and the running of the AST to determine whether detailed modelling will be required. The Environment Agency also provides a number of guidance documents and templates which can be used by the applicant to ensure that the correct information is supplied first time.

In Germany the 2015 “Ordinance on the Permit Procedure”²⁹ states that the authority shall discuss all relevant items related to the project with the applicant, give advice on the documents and data to be submitted and on the procedure itself. Representatives of other authorities can be asked to participate in a so called ‘Application conference’. The pre-application discussion is not obligatory.

Annex I of this document provides some examples of a screening list that is used in Schleswig-Holstein (federal state of Germany) for all kinds of projects (including pig and poultry farms) and that will become part of an information technology tool for the electronic application procedure.

²⁹ 9. BImSchV) [Ninth Ordinance for the Implementation of the Immission Control Act – Ordinance on the Permit Procedure – 9. BImSchV, of 29 May 1992, BGBl. I S. 1001, last amendment 28 April 2015, BGBl. I S. 670, 676]

7 EXAMPLES OF CRITERIA FOR DETERMINING SIGNIFICANT EFFECTS

7.1 INTRODUCTION

Member States have the power to choose the method they will use for screening, which can be applied by:

- a) Setting thresholds or criteria specifically defined
- b) Case by case examination
- c) Combination of a) and b)

In a) a member state can define a threshold or criteria such as size (number of pigs or poultry), location (sensitive ecological areas in particular) and potential impact (surface affected, duration), above which an appropriate assessment is mandatory. Member states can also decide that below those limits an appropriate assessment is not required. Such limits must be compliant with Article 6 (3), meaning that projects that are exempted do not have a 'likely significant effect' on the site's conservation objectives, as already explained in 3.2, which covers the thresholds for Habitats Directive and other Directives.

In b), on a case by case examination, a member state can require that all projects that are likely, by virtue inter alia of their nature, size or location, to have significant effects on the site's conservation objectives will be subject to an appropriate assessment. In this case there is the need to evaluate the impact caused by the plan or project on the interest features of the Natura 2000 site, depending on its characteristics, such as the total number of pigs or poultry but also land occupation, the distance from the Natura 2000 site or the protection objectives, natural resources requirements, soil, water and air emissions, extent of the excavation works, transportation demands, the length of the construction, operation or removal.

Member States can also combine methods described, for instance defining that under the threshold applied in a), all projects should still be evaluated on a case-by-case examination as in b).

In such circumstances, an authority clearly needs criteria for 'significance' to make a decision. The definitions of Article 1 Habitat Directive include a number of criteria, for example negative effects on the distribution and abundance of species population, reduction of the natural range of species, alteration of population dynamics of species, species and habitat loss, as well as a few standards of significance that are generally acknowledged, such as loss of habitat or species. In other cases authorities may look for applicable criteria in scientific studies or academic expertise, for example the influence of fertilizers (nitrogen oxides and ammonia), influence of acidifying substances or influence of noise emissions on birds.

The main difficulty is that there is often no defined and measurable relation between cause and effect, especially concerning pollutants like heavy metals, small amounts of additional fertilising substances coming in from industrial projects. This chapter aims to provide some information about criteria used in EU Member States for the screening of farm projects for the impacts and effects of some pollutants and also habitat loss.

7.2 APPROACH TO ASSESSING NITROGEN UNDER ARTICLE 6(3) OF THE HABITATS DIRECTIVE

The impacts of nitrogen emissions from agriculture on Natura 2000 sites are a considerable burden for many member states. Indeed, background levels of nitrogen at many Natura 2000 sites across Europe already exceed critical levels and loads and are being shown to have an impact on changes in vegetation communities and their resistance to secondary factors (for example frost resistance). Even in cases where manure spreading is prohibited directly within Natura 2000 sites, further input is still possible from the use of adjacent land for arable use or grassland under the Codes of Good Practice recommendations for fertilisers. Organic fertilisers can emit considerable amounts of ammonia such that it may large additional nitrogen burdens on adjacent land. Mineral fertilisers only emit to very low degree (1 %). However, farm manure emits – depending on the animal species – about 40 to 55 % of the TAN (total ammonium nitrogen, respectively 50–70 % of the nitrogen content of liquid manure) into the air (EMEP/EEA 2009, Part 4B AppendixB.xls). A rough estimate for cattle slurry results in 1 kg NH₃/m³.

Existing and future emissions from agricultural sources and their dispersion may be calculated. At the European level, the European Environmental Agency (EEA) has developed a tool for the assessment of existing background nitrogen deposition and for the calculation of changes caused by projects (EMEP/EEA 2009). This tool uses a kilo scale whereas competent authorities apply a gram scale.

Several countries have standards for the assessment of the impact of nitrogen compounds (ammonia and nitrogen oxides) in place or currently work on them. The current approach for the assessment of nitrogen deposition from an individual project depends on background air quality and existing nitrogen exceedances in the different member states. Member states should ensure that, where separate, both permit and inspection authorities use the same procedures - especially those with high background nitrogen deposition.

Many Member States have software tools for modelling the nitrogen deposition in place. As no new tool can be developed within the frame of this IMPEL project, different approaches will be described here.

7.2.1 THE DUTCH APPROACH - THE INTEGRATED APPROACH TO NITROGEN (PAS)

The AERIUS calculation tool, illustrated in Figure 7.1, is one of the cornerstones of the Integrated Approach to Nitrogen (PAS) in the Netherlands. It calculates the level of nitrogen deposition in Natura 2000 areas, caused by projects and development plans. AERIUS supports the issuing of permits for economic activities that involve the emission of nitrogen, and monitors whether the total nitrogen burden continues to decline. In addition, AERIUS also facilitates spatial planning in relation to nitrogen.

AERIUS may be used for calculations for all nitrogen-sensitive Natura 2000 areas and all nitrogen-emitting sectors (agriculture, industry, traffic & transport). In this way, AERIUS is in keeping with the area- and sector-exceeding character of the PAS.

Users may start a calculation in AERIUS by entering one or more emission sources onto a map, or upload a file containing the sources. Sources may be in the shape of points, lines or planes. The user also enters a number of source characteristics. For example, for the construction of a new farm for intensive rearing of pigs, the user may specify the animal category, the number of animals it will house, the type of sty, as well as some sty characteristics, such as the height of the ventilation holes. AERIUS, on the basis of this information, subsequently calculates the expected ammonia (NH₃) and nitrogen oxide (NO_x) emissions. In the above example of the intensive farm for rearing pigs, ammonia emission levels are calculated on the basis of animal category and the numbers of animals within the housing system. For this calculation, AERIUS uses the emission factors for animal housing systems derived from the Ammonia and Livestock Farming Regulation (Rav).

The AERIUS calculation centre OPS (Operational Priority Substances model; Van Jaarsveld 2012) subsequently calculates the spatial dispersion of the emissions and the deposition locations. Dispersion and deposition largely depend on meteorological factors and land use in the dispersion area. Nitrogen, for example, is more easily deposited in forests than on grassland. In addition, source characteristics, such as the position of ventilation holes, also play a role. Calculations are conducted in widening circles around the source or sources. On the screen, users can follow the expanding calculations. Calculation times mostly span a few seconds but may take up to several minutes for the more complex issues.

Calculations subsequently result in a map of nitrogen deposition, which is then combined with the map of Natura 2000 areas as available in AERIUS and the nitrogen-sensitive habitats within them. This immediately shows the areas and habitats affected by a particular project.

AERIUS also contains data on background deposition, based on emission data derived from the Pollutant Release and Transfer Register (PRTR) which is also used for drawing the RIVM map on long-range transboundary air pollution in the Netherlands.

AERIUS also contains data on critical loads of deposition (the values were based on the critical load values as set by the UNECE within a European context) for each type of habitat. AERIUS adds together the calculated amount of project-related deposition and the background

deposition, and subsequently shows, per location, the total deposition in relation to the critical load. For ecologists, this is crucial information to assess the situation.³⁰

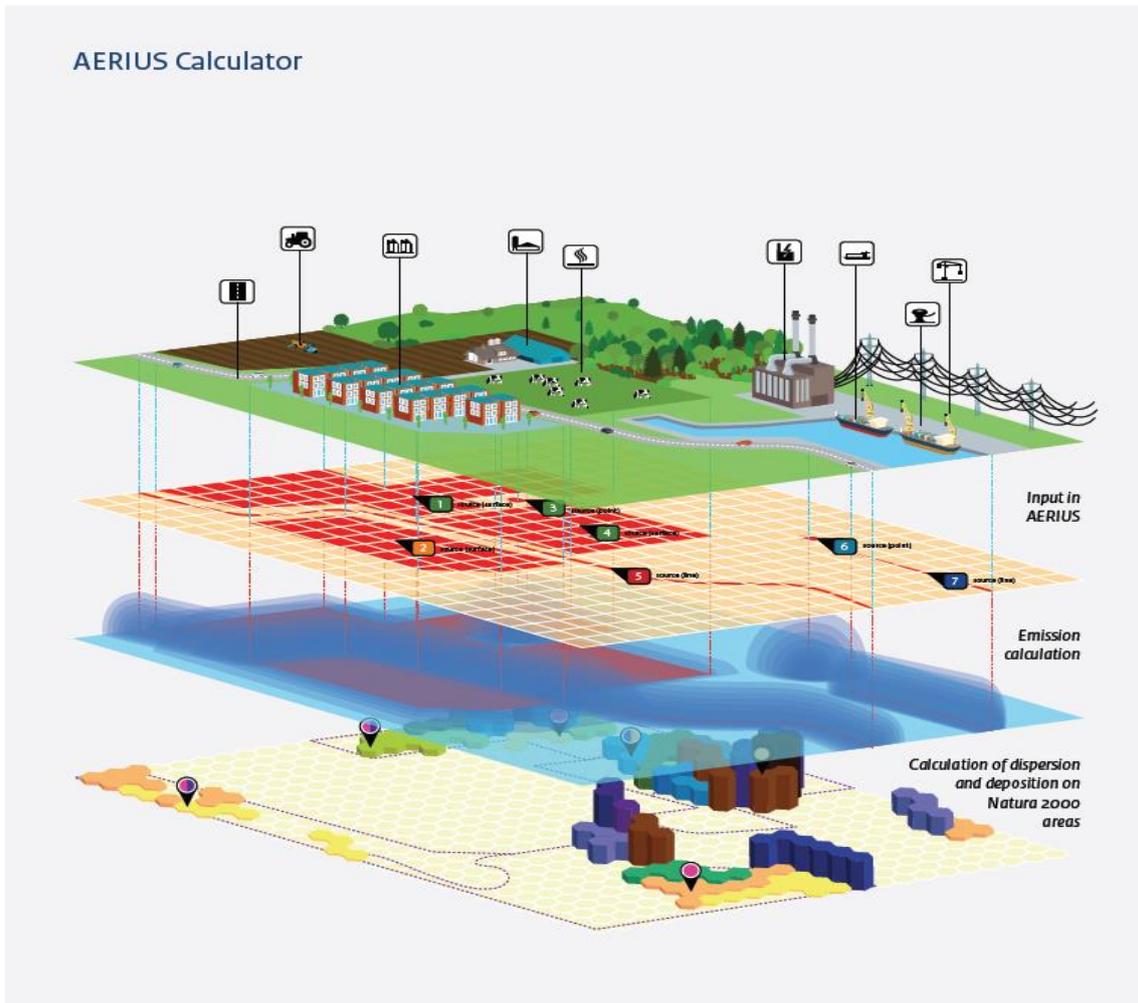


Figure 7.1: AERIUS; Schematic view of the steps of the calculation process (reference for diagram).

7.2.2 THE INTEGRATED APPROACH TO NITROGEN IN FLANDERS AND WALLONIA (BELGIUM)

Flanders and Wallonia (Belgium) are also working on an integrated approach to nitrogen. Working groups on models are currently assessing the possibilities for a calculation tool to support policy. The AERIUS project team has been invited to give advice to the working groups.

7.2.3 THE GERMAN APPROACH - CRITICAL LOAD THRESHOLDS OF INSIGNIFICANT IMPACTS AND BAGATELLE

For the last ten years impacts from nitrogen deposition within appropriate assessments has been a controversial issue, and discussed by many experts in Germany. More recent results

³⁰ Science at the core of policy and practice. AERIUS, the calculation tool of the Dutch Integrated Approach to Nitrogen. Ministry of Economic Affairs.

from the research and development study on Assessment of Nitrogen Deposition from Transport Activities in Sensitive Habitats³¹ financed by the Federal Highway Research Institute (BAST) have been published to establish a method on the assessment for road projects. This method will become part of the guidance document “Guidance on the Assessment of Nitrogen Deposition in the Appropriate Assessment for Road Projects” that provides advice for permit authorities. The method is also applicable for other project types. Currently an expert group of Federal Committee for Immission Control (LAI) and Federal Committee for Nature Conservation (LANA) are developing on a guidance document for competent permit and inspection authorities for industrial installations.

CUT-OFF CRITERION FOR SCREENING

Adverse effects from fertilising nitrogen compounds (ammonia and nitrogen oxides) are assessed in a staged approach based on the concept of critical loads: if the total environmental deposition is lower than critical loads of the most sensitive feature of the site, no likely significant effects is to be expected. Project contributions up to a de-minimis value of 0.3 kg N/(ha x yr) are considered as being too small to be traced back to a certain source.

As nitrogen inputs of up to 0.3 kg N/(ha x yr) cannot be realistically attributed to a particular project they should rather be described as diffuse part of the background deposition. High background deposition in turn should be lowered by the most efficient measures to stay in accordance with the requirement under the Habitat Directive to avoid deterioration. Very small project contributions as accepted by this method will not constitute an obstacle to this.

Nitrogen deposition of up to this value could not be detected in the field, nor could damage be attributed to projects contributing such small amounts. Project contributions lower than the threshold thus exert only hypothetical risks that do not justify or even demand refusals of projects under Article 6(3) Habitats Directive. Only project contributions above the cut off criterion have to be considered within appropriate assessment in combination with other projects.

THRESHOLD FOR APPROPRIATE ASSESSEMENT

With view on the protected site another threshold of 3 % of the critical load is applied that can be exceeded not only by single projects but also in combination. Its application does not depend on the degree of exceedance of the CL by the background deposition. It depends on the specific sensitivity of the habitat precautionary described by critical loads. Examination of scientific results on the effects, particularly along roads has shown that a value of 3 % of a particular critical load clearly lies below detectable adverse effects on the conservation status of Natura 2000 habitats. The above mentioned guidance document for road projects uses modelled critical load.

Both thresholds are very low and thus in line with the precautionary approach prescribed by the Habitats Directive. The assessment approach encompasses legal as well as scientific

³¹ “Untersuchung und Bewertung von Straßenverkehrsbedingten Nährstoffeinträgen in empfindliche Biotope” [research and development-project 84.0102.2009, abstract: <http://www.bast.de/DE/Verkehrstechnik/Publikationen/Download-Publikationen/Downloads/V-Naehrstoffeintrag.html>], long version: Heft 1099, ISBN: 978-3-95606-036-6.

confidence. It also adheres to the principle of proportionality and has proven to be functional in practice.

For carrying out the assessment exact information about ammonia emissions and exact calculations of the deposition in the Natura 2000 site are needed.

The German Federal Administrative Court has acknowledged the threshold of 3 % of the critical load for Natura 2000 sites in cases where the background deposition already exceeds the critical load.

In summary, the German approach regarding nitrogen deposition, uses modelled critical loads for the assessment of nitrogen deposition in habitat types of Annex I and plant species of Annex II of the Habitats Directive. The modelling is carried out with the tool used in the permit procedures for industrial installations. Thresholds of irrelevance are laid down at 0.3 kg N/(ha x yr), which generally applies also to sources that have to be assessed in the consideration of cumulative effects. If the critical load of a habitat type is already exceeded by the background deposition, a bagatelle threshold of 3 % of the individual critical load may be applied. For this threshold cumulating has to be carried out. Figure 7.2 shows the result of the calculation in an example of an installation for rearing of pigs (fattening pigs).

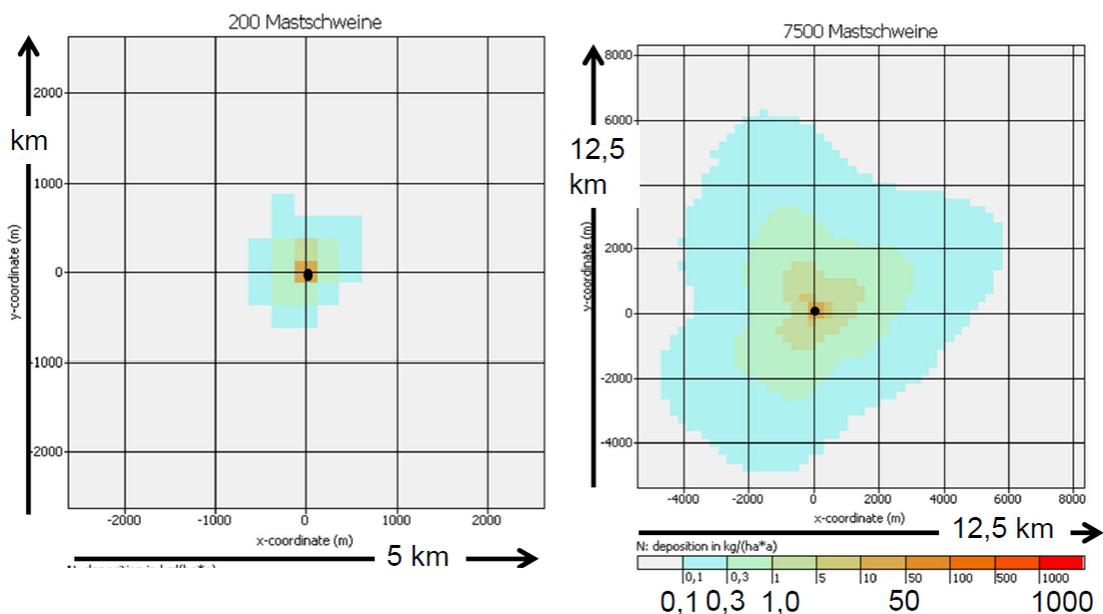


Figure 7.2: Example of the calculating tool of the German approach to N deposition. Distribution of nitrogen deposition in kg/(ha x yr) from rearing of fattening pigs (200 pigs (left) and 7500 pigs (right)).

In Annex II a more detailed explanation is given, concerning the German approach.

The results have been summarised in the following technical conventions on the assessment of nitrogen deposition in Natura 2000 sites.

German technical conventions on the assessment of Nitrogen deposition in Natura 2000 sites

- The basic principle of using the modelled Critical Loads for the assessment is acknowledged.
- The procedure is used for the assessment of nitrogen deposition in habitats of Annex I and plant species of Annex II Habitats Directive.
- The modelling of nitrogen depositions is done with the tool that is used in permit procedures for industrial installations.
- The threshold of irrelevance is 0,3 kg N/(ha x yr) - based on scientific study. Sources causing emissions lower than the cut-off criterion are as well irrelevant in the consideration of cumulative effects.
- For the assessment of cumulative effects only those sources have to be taken into consideration that have got a permit, started operation after the integration of the habitat in the list of habitats of European interest or of which the date of the start of operation is concrete.
- If the Critical Load of a habitat type is already exceeded by the background deposition, a bagatelle threshold of 3 % of the individual Critical Load may be applied. This threshold applies to all cumulative effects.

By using standardised methods and evaluation schemes a higher level of legal security is achieved. However, there will be an ongoing need to reassess the content on a regular basis, since scientific knowledge is developing rather fast in this field.

The knowledge of the manual for road projects and Natura 2000 is currently being transposed into a guidance document that will cover all kinds of industrial projects with nitrogen emissions and is applicable to farm projects as well as to large combustion plants. It will be published in near future.

AREA AFFECTED BY AMMONIA EMISSIONS FROM PIG AND POULTRY FARMS

The draft guidance proposes two kinds of approaches for determining the area affected:

a) the use of a simplified formula for farms with less than

2 000 places for fattening pigs

750 places for sows

40 000 places for poultry

b) modelling the additional load for farms exceeding these thresholds.

To a) the simplified formula is taken from the existing German guidance on nitrogen deposition that applies to protected areas under national law³².

$$x_s = \sqrt{F_s \cdot Q \cdot \frac{S_r}{S}}$$

x_s = distance from the source in meters

Q = ammonia emission in tonne(s) per year

S_r = 5 kg per ha and year (reference deposition of the ammonia guidance)

F_s = proportionality parameter

= 60 002 a x m²/t for a deposition velocity of 0,01 m/sec, 130 004 for $v_d = 0,02$ m/sec

= 0,01 m/sec for open land and 0,02 m/sec for other, more rough structures/surfaces at the point of deposition

Adjustments of F_s can be made to the individual situation in the Federal States.

In Northrhine Westfalia $F_s = 43\ 730$.

S = level of deposition in kg N/ha/a, here the threshold of 0,3 kg N /ha/a

The formula reflects the situation of forced ventilation without abatement measures and installations with the above mentioned capacities.

In case of higher numbers of places, other kinds of animals or mixed inventories the modelling approach (described under b)) has to be used for the determination of the area affected.

If there are no nitrogen-sensitive Natura 2000 sites within this calculated area, appropriate assessment is not necessary.

The areas affected by animal farms depend on the kind of animals and on their number. Under certain morphological and/or. meteorological conditions (e.g. with wind channels in valleys) the areas may slightly increase.

If there are nitrogen-sensitive Natura 2000 sites within the calculated impact area, further assessment has to be carried out for the additional deposition by modelling.

To b) Calculation/modelling of the additional load

For projects with or with more than 2 000 places for fattening pigs, 750 places for sows or 40000 places for poultry the calculating/modelling of the additional load caused by the project follows the procedure described in the "Technical Instructions on Air Quality Control" (TA Luft). Normally the area of the atmospheric dispersion modelling has to cover the whole area affected by the project. This is a conservative approach (precautionary principle).

Related to Natura 2000 sites, the affected area is the area in which the additional load exceeds 0.3 kg / (ha x yr). For ammonia the modelling is done according to the requirements of TA Luft with a deposition velocity of 0,01 m/sec. In the reference model (AUSTAL 2000) this velocity is the basic velocity. In many cases this is not sufficient. Deposition velocities for different categories of roughness of the surface can be found in the guidance VDI 3782 part 5

³² Leitfaden zur Ermittlung von Stickstoffeinträgen der Bund-Länder-Arbeitsgemeinschaft Immissionsschutz, long version, 2012; http://stickstoff.naturschutzinformationen-nrw.de/site/files/stickstoff/einleitung/LAI_N-Leitfaden_Langfassung_M%C3%A4rz_2012.pdf.

“Environmental meteorology – Atmospheric dispersion models – Dispersion parameters³³. According to it the average deposition velocity for forests is 0,02 m/sec. For estimating the nitrogen-import into an ecosystem beyond the requirements of TA Luft with other deposition velocities than used in AUSTAL 2000 the dry deposition calculated by AUSTAL 2000 is multiplied with the quotient of the deposition velocity for the individual ecosystem ($v_{d;\ddot{O}}$) of VDI 3782 part 5 and the mesoscaline deposition velocity used in AUSTAL 2000. If the emission mass flow of ammonia is indicated in the atmospheric dispersion modelling as ammonia and not as nitrogen, the deposition for ammonia (s_{NH_3}) calculated with AUSTAL 2000 has to be converted into s_N by using the quotient of the molar mass of nitrogen ($M_N = 14$ g/mol) and ammonia ($M_{NH_3} = 17$ g/mol).

The formula is:

$$s_N = s_{NH_3} \cdot \frac{v_{d;\ddot{O}}}{v_{d;M}} \cdot \frac{M_N}{M_{NH_3}}$$

With the calculated additional load the assessment of the compliance with the threshold is carried out. If the threshold is not exceeded, no further assessment has to be carried out.

7.2.4 APPROACH TO THE ASSESSMENT OF AMMONIA AND NITROGEN DEPOSITION IN ENGLAND

Assessment of ammonia impacts on nature conservation sites in England is undertaken in relation to both the direct effects of air pollution and indirect impacts from nutrient nitrogen deposition (eutrophication) and acid deposition (acidification). The approach detailed below relates to IED intensive farming environmental permitting only, however assessments are carried out in a consistent and risk-based way for all regulated activities.

Screening is carried out during both pre-application and permit determination using the best, most up-to-date information available at the time on the distribution of sites, habitats and species important for biodiversity in England. The screening process involves making a balanced judgment about the environmental and legal risks associated with each type of activity against the sensitivity of the nature conservation interest present in that location.

To improve the quality, and reduce the number of applications requiring detailed modelling the competent authority (Environment Agency) have developed a bespoke pre-application screening service. Using information collected by environment officers at pre-application meetings, the Environment Agency screen the applicant’s proposals using the Ammonia Screening Tool (AST) to determine whether they will need to employ a consultant to undertake detailed modelling. As a result of pre-application, a considerable number of applications screen out from requiring detailed modelling and ensure applicants do not undertake lengthy or costly modelling where it is not required. The screening and modelling informs the applicant as to whether their proposals are likely to be acceptable and whether they need to adopt abatement techniques. The applicant should then provide the information needed in

³³ [VDI 3782, part 5, April 2006, available at Beuth Verlag GmbH, 10772 Berlin]

their application to enable us to assess the impact of their ammonia emissions on Natura 2000 sites.

Where detailed modelling is required the applicant will need to provide with their application, a report which includes the following information:

- confirmation of the appropriate critical level and critical load,
- modelling of emissions with isopleth maps covering all relevant Natura 2000 sites, where pre-application screening indicates it is needed,
- justification of how they will achieve their allowable process contribution (proposed mitigation) at the relevant Natura 2000 sites.

CRITICAL LEVEL AND CRITICAL LOAD ASSIGNMENT

The assignment of correct critical levels and critical loads is essential to the assessment process. In April 2007 the ICP Task Force on Modeling and Mapping (The International Cooperative Programme (ICP) on Mapping and Modelling is an expert group established under the Convention on Long-Range Transboundary Air Pollution (CLRTAP) to agree techniques to be used for the assessment of effects, including environmental criteria) adopted new critical levels for the effects of ammonia on vegetation. The following critical levels have been applied in the UK, in accordance with the ICP Task Force. Where:

- lichens and bryophytes are integral to the conservation site apply a critical level of $1\mu\text{g}/\text{m}^3$,
- higher plants are the primary reason for designation apply a critical level of $3\mu\text{g}/\text{m}^3$.

The critical load relates to the quantity of pollutant deposited from air to the ground, whereas the critical level is the gaseous concentration of a pollutant in the air. The application of a critical level of $3\mu\text{g}/\text{m}^3$ is not as protective as applying the lowest available critical load of 5 kg N/ha/yr to the same habitat type. The use of critical levels greater than $1\mu\text{g}/\text{m}^3$ could result in deposition above the minimum critical loads for nitrogen deposition and hence only applying a critical level for ammonia in such cases may not provide full protection for the Natura 2000 site. Therefore, where a critical level of $3\mu\text{g}/\text{m}^3$ is appropriate, a critical load must also be assigned to the Natura 2000 site and deposition of nutrient nitrogen and acid considered. Appropriate critical loads are identified using the Air Pollution Information System (APIS: apis.ac.uk) as best available information.

SCREENING PROCEDURE

The Environment Agency employ a series of pre-risk assessed screening thresholds in a staged approach, to determine whether the process contribution from a new or expanding intensive farm is acceptable. The thresholds are percentages of the relevant critical level and critical load for the most sensitive Natura 2000 site feature, if process contributions from the farm are less than the critical level or critical load threshold, no likely significant effect can be established.

Where the most protective of these thresholds are exceeded, the Environment Agency will undertake an appropriate assessment to determine potential for adverse effect on the Natura

2000 site. A process flow diagram illustrating the English screening approach can be found at Figure 7.3.

The Environment Agency use a hierarchical approach based on the level of designation to apply different thresholds to the nature conservation sites, where thresholds for European sites are more protective than those for national (SSSI) or local conservation designations. Table 7.1 below details these thresholds for Natura 2000 sites.

Table 7.1: Natura 2000 site screening thresholds

Site designation	Standard screening distance from farm (km)	% Likely significant effect threshold ^{NOTE1}	% Adverse effect threshold ^{**}
SAC/SPA/Ramsar*	10	4	20

* Process contributions from the installation calculated as a percentage of the relevant critical level or critical load.

** It is UK government protocol to treat Ramsars with the same level of protection as that afforded to Natura 2000 sites; hence any further reference to Natura 2000 sites in this section should be assumed to include Ramsar sites also.

Distance screen: Where the Natura 2000 site is greater than 10 km from the farm, the impacts from the installation require no further assessment on the basis that emissions beyond this distance are expected to be inconsequential. Any Natura 2000 sites within a 10 km radius of the farm must then proceed to a simple assessment of likely significant effect.

Simple assessment: Using the results of the AST, if the process contribution from the farm is below 4 % of the relevant critical level or critical load, then the farm is considered to have no likely significant effect on the Natura 2000 site, and can be permitted with no further assessment. Where the process contribution is between 4 and 20 % and the points below apply, an assessment alone and in combination is required:

there are one or more intensive farms within 10 km and there is potential for in-combination effects,

The farm is subject to an ammonia improvement condition*.

**ammonia improvement condition – condition included during permitting which requires operator to reduce ammonia emissions by a specific amount and within a specific time period, in order to meet the 20% threshold.*

An overlapping in combination assessment will be completed where existing farms are identified within 10 km of the application. The Environment Agency believe that beyond 10 km, process contributions (PC) from the farm are inconsequential, and therefore fall out of the requirement for an in-combination assessment. Any existing farm within the 10 km screening distance is relevant for consideration in an in-combination assessment. This ensures that all potential effects are considered. The AST is used to estimate ammonia concentrations from neighbouring farms at the maximum concentration point for the proposed or expanding farm. The sum of the estimated ammonia contributions will provide an overlapping in-combination concentration.

For existing farms with a PC of greater than 4 % and within 10 km of the proposed farm, the following assumptions are applied.

If $\sum PC < 20\%$ of critical level or load no further assessment is required and it is possible to conclude no adverse effect alone and in combination.

If $\sum PC > 20\%$ of the critical level or load a site specific assessment should be carried out as part of the detailed assessment (see below). If $\sum PEC^*$ is less than the critical level or critical load then no further assessment is required and it is possible to conclude no adverse effect alone and in combination.

**Predicted environmental concentration (PEC) is the $\sum PC$'s plus background (as detailed in APIS).*

Detailed assessment: Detailed modelling is required at Natura 2000 sites where AST screening predicts that the $\sum PC$ of farms which could act in-combination is $> 20\%$ of the critical level or load, where the $\sum PEC$ is greater than the critical level or load and/or for all sites where the PC alone exceeds 20 %. This detailed assessment takes the form of an appropriate assessment, and includes consideration of a variety of elements including (but not limited to):

- detailed modeling and associated isopleth maps,
- confirmation of correct critical levels,
- spatial distribution and/or seasonality of features within the Natura 2000 site,
- any site relevant critical loads,
- Ellenberg indicator values*,
- confirmation of any in-combination impacts with existing farms,
- site condition monitoring,
- any on-site evidence of impacts from existing farms,
- conservation objectives, management and favourable conservation status of the Natura 2000 site.

**Ellenberg indicator values - classification of plants according to the position of their realised along an environmental gradient.*

For farms acting in-combination with existing permitted farms, the overlapping effect can be assessed by studying the isopleth diagrams (provided as part of any detailed modelling) for predicted annual averaged air concentrations for ammonia for the existing farms, and calculating the joint impact at the maximum concentration point (at the Natura 2000 site) for the proposed farm.

The appropriate assessment will determine whether an exceedence of 20 % of the relevant critical level or critical load would result in an adverse effect, when considering the factors set out above. The scope and content of the appropriate assessment is based upon the location and size of the farm, and magnitude of effect on the Natura 2000 site.

If the appropriate assessment indicates emissions are unacceptable, further controls on ammonia releases from the farm may be required. These controls may be more stringent than would otherwise be required by the use of best available techniques. Where it cannot be concluded that the exceedence will have no adverse effect on the Natura 2000 site, the applicant must submit a plan to the competent authority outlining how they will reduce their ammonia emissions as part of the permit application. Depending on the chosen reduction techniques, it may be necessary to include monitoring conditions within the permit to ensure the techniques achieve the proposed reductions.

The proposed reduction techniques are considered by the competent authority ahead of granting a permit. Where the proposal to reduce ammonia emissions is considered robust and justified, a permit with monitoring conditions may be granted. However, if the competent authority do not deem the proposals appropriate or justified, permit refusal will be considered.

A list of possible scenarios expected to be reached following the assessment process and the subsequent actions to be taken in terms of granting/refusing a permit is shown on Table 7.2 and Figure 7.3.

Table 7.2: Permit scenarios for intensive farms with respect to ammonia emissions and nitrogen deposition.

Scenario	Outcome
The farm, as proposed in the application, would not impact on a nearby conservation site.	Permit
<p>The farm, as proposed in the application, would impact on a nearby Natura 2000 site in-combination with other permitted farms. (2)</p> <p>There are three in-combination scenarios for the new farm as follows:</p> <ul style="list-style-type: none"> • there is an existing 'impact cluster' at the Natura 2000 site. All the headroom up to Z % will have been taken up by the existing farms; • there is now an in-combination impact with a single existing farm. This farm will have or had an improvement condition in its permit to achieve Z %; • there is now an in-combination impact with at least one existing farms who's current impact(s) are above Y % but less than Z %. 	<p>The farm is allowed whichever is the greatest process contribution at the Natura 2000 site:</p> <ul style="list-style-type: none"> • insignificance threshold (Y%); • remaining available headroom up to the maximum allowable process contribution (Z %). <p>Permit.</p>
The farm, as proposed in the application, would impact on a nearby Natura 2000 site on its own.	<p>The maximum allowable process contribution at the Natura 2000 site is Z %.</p> <p>Permit.</p>
<p>The farm, as proposed in the application, would impact on a nearby Natura 2000 site in-combination with other farms that already have permits. (4)</p> <p>There are three in-combination scenarios for the new farm as follows:</p> <ul style="list-style-type: none"> • there is an existing 'impact cluster' at the Natura 2000 site. All the headroom up to Z % will have been taken up by the existing farms; • there is now an in-combination impact with a single existing farm. This farm will have or had an IC in its permit to achieve Z %; • there is now an in-combination impact with at least one existing farms who's current impact(s) are above Y % but less than Z %. 	<p>The new farm is allowed whichever is the greatest process contribution at the Natura 2000 site:</p> <ul style="list-style-type: none"> • insignificance threshold (Y %); • remaining available headroom up to the maximum allowable process contribution (Z %). <p>Permit.</p>
<p>An existing permitted farm with improvement conditions limiting the process contribution, applying for a variation to expand.</p> <p>Natural England have carried out site surveys and identified damage consistent with ammonia.</p>	<p>The operator must stay within the current IC limits and no further increase is allowed.</p> <p>Permit.</p>

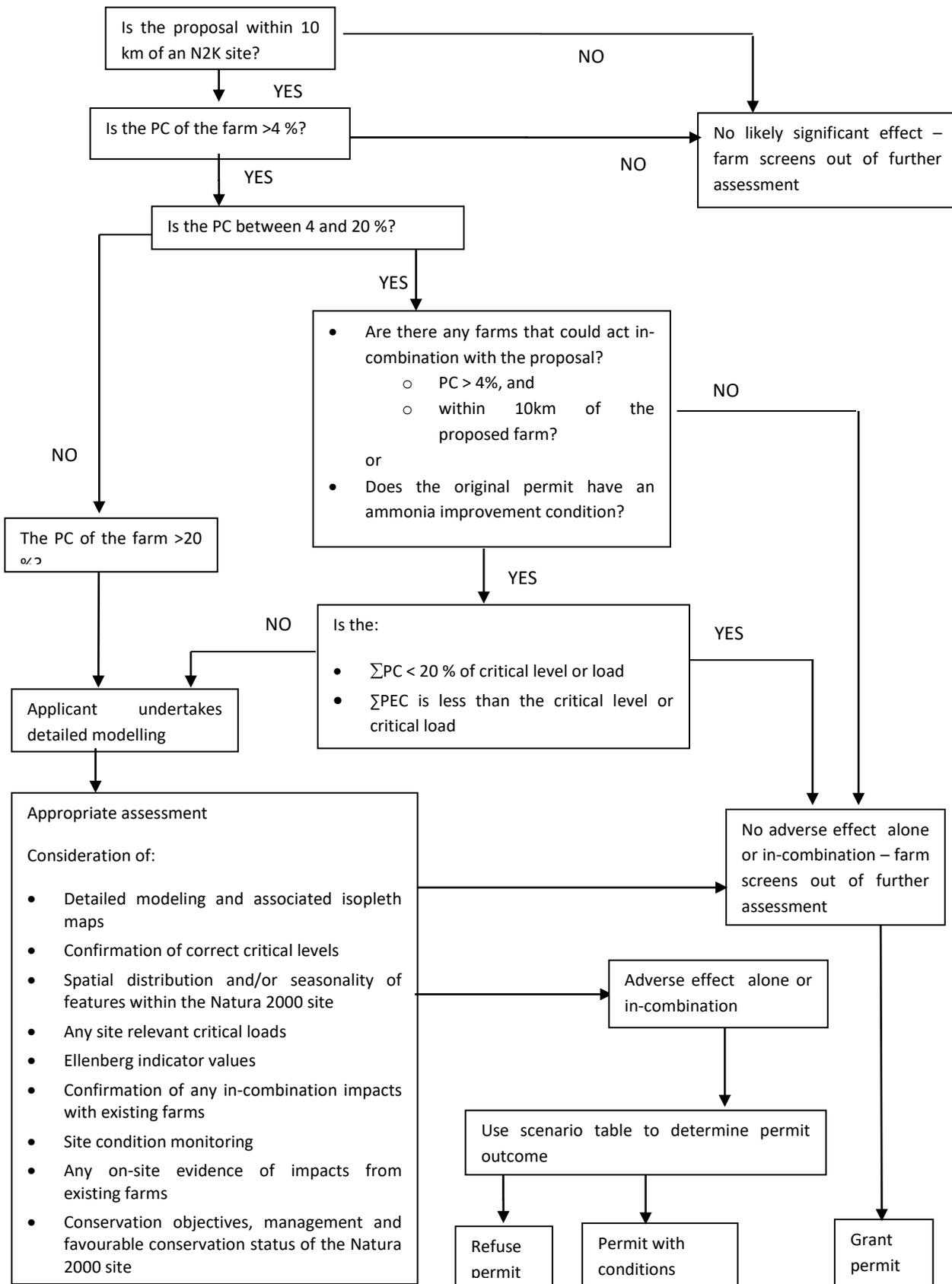


Figure 7.3: Process flow diagram of ammonia and nitrogen deposition assessment in the UK for intensive farming activities (where Natura 2000 site is referred to as N2K).

7.2.5 THE APPROACH OF DENMARK

In Denmark, as shown in Table 7.3, a threshold is applied for the total contribution to nearby sensitive Natura 2000 habitats from each production unit. The total allowable contribution from one livestock unit is 0.7 kg N/ha/a if there are no other livestock farms within a certain distance from the applicants farm. If there is one other livestock farm within this distance, a total of 0.4 kg N/(ha x yr) is allowed, and if there are two or more other livestock farms, a total of only 0.2 kg N/ha/a is allowed. The fixed ceilings are based on the assumption that as long as the deposition is below 1 kg N/(ha x yr) it will not be possible to detect a measurable biological effect.

This implies that existing emissions may have to be reduced if the threshold requirements are not met today.

Table 7.3: Regulation for livestock farms in Denmark.

Category 1: Ammonia sensitive Natura 2000 habitats	Max. total deposition depending on number of animal units nearby*: 0,2 kg N/(ha x a) if > 1 animal unit 0,4 kg N/(ha x a) if 1 animal unit 0,7 kg N/(ha x a) if 0 animal unit
Category 2: Ammonia sensitive habitats outside international protected sites	Max. total deposition 1,0 kg N/(ha x a)
Category 3: Heathland, bogs and grassland which are protected acc. to § 3 of nature conservation act or ammonia sensitive forests	Municipality carries out an assessment whether conditions on max. additional deposition shall be set and which requirements concerning the depositions are. However the requirement should not be below a max. additional deposition of 1,0 kg N/(ha x a)

*defined as (cumulative model): no. units > 15 Animal Unit (AU) within 200 m + no. units > 45 AU within 200 – 300 m + no. units > 75 within 300 – 500 m + no. units > 150 AU within 500 – 1000 m + no. units > 500 AU contributing with > 0,3 kg N/ha beyond 1 000 m.

For modelling the ammonia dispersion and deposition the tool of the National Environmental Research Institute (standard deposition curves on OML-DEP-Modell) has to be used.

Apart from the specific assessment of farm projects in the neighborhood of ammonia sensitive habitats, all applicants with > 75 AU have to comply with general N-emission reduction demands. This general approach complies with the demands of the NEC Directive to reduce national emission. The obligation applies to changes and extensions / upgrading. Depending on the animal species a reduction rate ranges from 15 to 20 % in comparison to the reference housing system of 2005/2006.

7.3 OTHER SUPPORTING TOOLS - SCREENING AND ASSESSMENT TOOLS IN PRACTICE

7.3.1 THE GERMAN APPROACH TO HABITAT LOSS

The German standards of significance for habitat loss from the Federal Agency for Nature Conservation, "Expert Agreement for the Assessment of Significance in Appropriate Assessment (http://www.bfn.de/0306_ffhvp.html) have been developed under broad participation of scientific experts. They are used successfully in practice and estimated as best scientific knowledge.

The direct and permanent loss of a part of a habitat, which is part of the conservation objectives of the site, is in general a significant effect. Effects can only be considered non-significant if they completely fulfil five cumulative criteria:

- no important, particular or special function or variant of the habitat is to be affected,
- a quantitative absolute threshold for which an orientation value has been defined for each habitat type in a table will not be reached or exceeded,
- a quantitative relative threshold of 1 % of the habitat in the Natura 2000 site will not be reached,
- no other cumulative losses shall lead to an exceeding of threshold values,
- no other types of impacts shall lead to an exceeding of the values and thus significant effects.

DEVELOPMENT OF THRESHOLDS FOR HABITAT LOSS FOR HABITAT TYPES

In a two-step procedure, thresholds for all habitat types have been developed. Table 7.4 shows examples of habitat types with the assigned orientation values.

Table 7.4: Habitat types with assigned orientation values.

code	Habitat type		m ²	m ²	m ²
		class	Level I	Level II	Level III
			If loss ≤ 1 %	If loss ≤ 0,5 %	If loss ≤ 0,1 %
9110	<i>Luzulo Fagetum</i> Beach Forest	5	250	1 250	2 500
9130	<i>Asperulo Fagetum</i> Beach Forest	5	250	1 250	2 500
9170	Oak Hornbeam Forest	4	100	500	1 000
6510	Lowland hay meadows	4	100	500	1 000
4030	European dry heaths	3	50	250	500
6120*	Xeric sand calcareous grasslands	2	25	125	250
7110*	Active raised bogs	1	0	0	0

DEVELOPMENT OF ORIENTATION VALUES FOR “QUANTITATIVELY ABSOLUTE LOSS OF HABITATS OF SPECIES”

Species and their habitats are inseparably connected to each other, however habitats are more measurable in terms of benefit or damage. Natura 2000 sites are populated according to their habitat potential, and permanent habitat losses are usually considered to have a permanent effect on the population size unless there are “minor losses” which are within species-specific tolerances.

For the identification of species-specific tolerances the following key questions were answered, regardless of the type of permanent habitat loss:

- Can a decline of protected species and a deterioration of the conservation status can be excluded?
- Can it nevertheless be considered as “qualitative and quantitative stability”?
- Can the strict precautionary principle (ECJ) is still guaranteed?

Table 7.5 shows examples of orientation values for species (Lambrecht & Trautner 2007³⁴).

Table 7.5: Examples of orientation values (OV) for habitats of species.

species	Basic OV	Middle OV	High OV	Typing of habitat demand depending on individual species ³⁴
	Conditions level I	Conditions level II	Conditions level III	
Red Kite	10 ha ²⁾	-	-	6d
Black Woodpecker	2,6 ha ²⁾	-	-	4
Eurasian Pygmy Owl	6 400 m ²	3,2 ha	6,4 ha	4
Mouse-Eared Bat	1 600 m ²	8 000 m ²	1,6 ha	6d
Bechstein’s Bat	1 600 m ²	8 000 m ²	1,6 ha	4
Great Crested Newt	640 m ²	3 200 m ²	6 400 m ²	6e
Fire-Bellied Toad	640 m ²	3 200 m ²	6 400 m ²	6e
Whinchat	400 m ²	2 000 m ²	4 000 m ²	6a
Bluethroat	400 m ²	2 000 m ²	4 000 m ²	6a
<i>Euphydryas aurinia</i> (Marsh Fritillary)	40 m ²	200 m ²	400 m ²	4
<i>Vertico moulinsiana</i> <i>Desmoulins?</i>	10 m ²	50 m ²	100 m ²	4
Aquatic Warbler	No OV ¹⁾			2b

³⁴ The complete table and the typing of habitat demand can be found in Tab. 3 of the “Fachinformationssystem und Fachkonventionen zur Bestimmung der Erheblichkeit im Rahmen der FFH-VP” , http://www.bfn.de/0306_ffhvp.html].

NITROGEN DEPOSITION AND HABITAT LOSS

Nitrogen deposition does not usually lead to a total loss of habitat. The risk of damage differs according to the sensitivity of habitats and the level of the critical load exceedance. The assessment system presented in the “Guidance on the Assessment of Nitrogen Deposition in the Appropriate Assessment for Road Projects”, draft (see section 7.1.3) is based on different classes of “gradual function loss” (e.g. 40 %, 60 %, 80 % of a total loss).

- Threshold for a tolerable loss of habitat 9130 (beech forests): 1 000 m²,
- Threshold for a tolerable “gradual function loss” of 40 %: 1 400 m².

The above mentioned thresholds expressed in m² apply to all cumulative impacts, i.e. to real and virtual habitat losses back to the site designation.

7.3.2 THE “EFFECTENINDICATOR” – THE DUTCH SCREENING TOOL

The Effectenindicator Natura 2000 is the Dutch IT pre-screening tool for promoters, licensing authorities and planners who have to deal with activities in or near Natura 2000 sites. The Effectenindicator Natura 2000 contemplates disturbance factors (Table 7.6), activities (7.7) and classes of sensitivity (7.8).

Table 7.6: *Effectenindicator Natura 2000: disturbance factors.*

Order	Disturbance factor
1	Habitat loss
2	Habitat fragmentation
3	Acidification by atmospheric nitrogen
4	Eutrophication by atmospheric nitrogen
5	Desalinization
6	Salinization
7	Pollution
8	Drought
9	Waterlogging
10	Change flow
11	Change the frequency of flooding
12	Change of substrate dynamics
13	Disturbance from noise
14	Disturbance from light
15	Disturbance by vibration
16	Optical disturbance
17	Disturbance by mechanical effects
18	Change in population dynamics
19	Conscious change of species composition

Table 7.7: Effectenindicator Natura 2000: activities.

Order	Activities
1	Species introduction
2	Maintenance of water bodies
3	Inundation and retention
4	Surface water levels management
5	Surface water abstraction
6	Groundwater abstraction
7	Housing
8	Business Park
9	Industry
10	Railroad
11	Waterway
12	Road
13	Cables and pipes
14	Hunting
15	Land-based agriculture
16	Landless agriculture (greenhouses)
17	Coastal and sea professional fishing
18	Freshwater professional fishing
19	Sport fishing
20	Water recreation
21	Country recreation
22	Military activities
23	Coastal and dike improvement
24	dams and reservoirs
25	Land reclamation
26	Sand and gravel extraction
27	Oil and gas extraction
28	Wind turbines

Table 7.8: Effectenindicator Natura 2000: classes of sensitivity.

Colour	Classes of sensitivity
Red	Very sensitive
Amber	Sensitive
Green	Not sensitive
☒	Not applicable
...	Unknown

■	zeer gevoelig
■	gevoelig
■	niet gevoelig
☒	n.v.t.
...	onbekend

Intensive rearing of poultry and pigs can be included in the activity 'landless agriculture'. Disturbing factors listed in Table 7.9 could be considered relevant regarding intensive rearing of poultry and pigs.

Table 7.9: Effectenindicator Natura 2000: Disturbance factors.

Order	Disturbance factor
1	Habitat loss (when located inside Natura 2000 sites)
2	Habitat fragmentation (when located inside Natura 2000 sites)
3	Acidification by atmospheric nitrogen
4	Eutrophication by atmospheric nitrogen
7	Pollution (dust and odour emissions to air)
12	Change of substrate dynamics (by manure spreading)
13	Disturbance from noise
18	Change in population dynamics (by manure spreading)

When classifying the sensitivity to nitrogen deposition, the Effectenindicator uses the format in sensitivity classes already mentioned in 4.7.5.3. – 'Using nitrogen critical loads exceedance in the framework of the habitats conservation status assessment of Article 17 of the Habitats Directive':

- Highly sensitive: < 1400 mol of N/ha/yr (20 kg of N/ha/yr)
- Sensitive: ≥ 1400 - < 2400 mol of N/ha/yr (≥ 20 - < 34 kg of N/ha/yr)
- Less / non-sensitive: ≥ 2400 mol of N/ha/yr (≥ 34 kg of N/ha/yr)

Example of Effectenindicator Natura 2000 exercise:

- Habitat type: 4030 European dry heaths
- Disturbance factors:
 - eutrophication by nitrogen deposition from the atmosphere
 - acidification by nitrogen deposition from the atmosphere

The screenshot shows the 'Effectenindicator' page on the Natura 2000 website. The navigation bar includes 'Home', 'Soorten', 'Gebieden', 'Natura 2000', and 'Sitemap'. The breadcrumb trail is 'Home > Natura 2000'. The left sidebar contains a menu with 'Effectenindicator' selected. The main content area is titled 'Effectenindicator' and contains instructions: 'Selecteer eerst hieronder een of enkele habitattypen en/of soorten. Selecteer daarna een of enkele storingsfactoren en kies dan 'Toon effecten', er verschijnt dan een soorten/habitattypen - storingsfactoren tabel: wat is de gevoeligheid van een soort/habitatype voor verschillende storingsfactoren.' Below this is a section 'Soorten-, habitattypen- en storingsfactorenkeuze' with two steps. 'Stap 1' is a scrollable list of habitat types, with '4030 - Droge heiden' selected. 'Stap 2' is a list of 19 disturbance factors, with '3 - Verzuring door stikstof uit de lucht' and '4 - Vermesting door stikstof uit de lucht' checked. A 'Toon effecten' button is at the bottom.

Home Soorten Gebieden **Natura 2000** Sitemap

Home > Natura 2000

> Procedure
> Natura 2000-gebieden
> Habitattypen
> Effectenindicator
> Routeplanner beschermde natuur

> Gebieds- en activiteitenkeuze

Effectenindicator

Selecteer eerst hieronder een of enkele habitattypen en/of soorten. Selecteer daarna een of enkele storingsfactoren en kies dan 'Toon effecten', er verschijnt dan een soorten/habitattypen - storingsfactoren tabel: wat is de gevoeligheid van een soort/habitatype voor verschillende storingsfactoren.

> Gebieds- en activiteitenkeuze

Soorten-, habitattypen- en storingsfactorenkeuze

Stap 1
Selecteer een of enkele habitattypen en/of soorten

- 2130 - Grijze duinen
- 2140 - Duinheiden met kraaihei
- 2150 - Duinheiden met struikhei
- 2160 - Duindoornstruwelen
- 2170 - Kruiwilgstruwelen
- 2180 - Duinbossen
- 2190 - Vochtige duinvalleien
- 2310 - Stuiwzandheiden met struikhei
- 2320 - Binnenlandse kraaiheibegroeiingen
- 2330 - Zandverstuivingen
- 3110 - Zeer zwakgebufferde vennen
- 3130 - Zwakgebufferde vennen
- 3140 - Kranswierwateren
- 3150 - Meren met krabbenscheer en fonteinkruid
- 3160 - Zure vennen
- 3260 - Beken en rivieren met waterplanten
- 3270 - Slikkige rivieroeveren
- 4010 - Vochtige heiden
- 4030 - Droge heiden**
- 5130 - Jeneverbesstruwelen
- 6110 - Pionierbegroeiingen op rotsbodem
- 6120 - Stroomdalgraslanden
- 6130 - Zinkweiden
- 6210 - Kalkgraslanden
- 6230 - Heischrale graslanden
- 6410 - Blauwgraslanden

Toon effecten

Stap 2
Selecteer een of enkele storingsfactoren

- 1 - Oppervlakteverlies
- 2 - Versnippering
- 3 - Verzuring door stikstof uit de lucht
- 4 - Vermesting door stikstof uit de lucht
- 5 - Verzoeting
- 6 - Verzilting
- 7 - Verontreiniging
- 8 - Verdroging
- 9 - Vernatting
- 10 - Verandering stroomsnelheid
- 11 - Verandering overstromingsfrequentie
- 12 - Verandering dynamiek substraat
- 13 - Verstoring door geluid
- 14 - Verstoring door licht
- 15 - Verstoring door trilling
- 16 - Optische verstoring
- 17 - Verstoring door mechanische effecten
- 18 - Verandering in populatiedynamiek
- 19 - Bewuste verandering soortensamenstelling

The results are the following:

Home > [Natura 2000](#)

> Procedure
> Natura 2000-gebieden
> Habitattypen
> **Effectenindicator**
> Routeplanner beschermde natuur

Effectenindicator

Overzicht effecten op soorten en/of habitattypen.

> [Terug naar zoekopdracht](#)

Vermesting door N-depositie uit de lucht
Verzuring door N-depositie uit de lucht

Storingsfactor	3	4
Habitatype 4030	■	■

■ zeer gevoelig
■ gevoelig
■ niet gevoelig
☒ n.v.t.
... onbekend

Disturbance factors:

- eutrophication by nitrogen deposition from the atmosphere: The selected habitat is very sensitive (red),
- acidification by nitrogen deposition from the atmosphere: The selected habitat is very sensitive (red).

If there is no increase of nitrogen deposition, the screening finishes here.

If there is an increase of nitrogen deposition, they shall be further assessed.

7.3.3 EXPERT INFORMATION SYSTEM / DATABASE WITH ECOLOGICAL INFORMATION ABOUT SENSITIVITY OF HABITATS AND SPECIES AND SIGNIFICANCE OF IMPACT FACTORS – THE GERMAN IT TOOL

The Federal Agency for Nature Conservation also developed an online database to support the public dealing with appropriate assessments. In this “Appropriate Assessment Information System” (called FFH-VP-Info), the scientific data and information which is needed in an appropriate assessment are systematically collected and made available:

- basic information about more than 140 types of projects and plans, their impact factors and their possible relevance to adverse effects on Natura 2000 sites,
- definitions and explanations of 36 types of impacts and their possible effects on habitats and species,
- detailed information based on scientific literature, particularly about potential adverse effects on the habitat types and species listed in the Annexes of the Nature Directives, structured in:
 - sensitivity / vulnerability,
 - ability for regeneration,
 - methods for prediction and assessing effects,
 - thresholds of relevance,
 - thresholds of significance.

This tool is, in particular, a support for proponents, planning agencies, nature conservation and competent authorities and the general public involved in appropriate assessments.

A list of potential impacts on habitat types and habitats of species included in Natura 2000 sites is proposed. Those which could be a consequence of intensive rearing of poultry and pigs are highlighted in amber³⁵. The relevance of each is given in form of an indicator (0 generally not relevant, 1 potentially relevant, 2 regularly relevant):

Impact group	Impact factor	Relevance
1 Direct land take	1-1 Habitat loss	2
2 Change of structure/use	2-1 Direct changes of vegetation- and biotope structures	2
	2-2 Loss /Change of characteristic dynamics	1
	2-3 Intensification of agriculture, silviculture and aquaculture uses	1
	2-4 Short time abandonment of habitat characteristic use/tending	0
	2-5 Long time abandonment of habitat characteristic use/tending	0
3 Change of abiotic site conditions	3-1 Alteration of soil or subsoil	2
	3-2 Alteration of morphologic conditions	1
	3-3 Alteration of hydrologic/hydrodynamic conditions	1
	3-4 Alteration of hydro chemical conditions	1

³⁵ <http://ffh-vp-info.de/FFHVP/Projekt.jsp?m=1,0,12,4>

	3-5 Alteration of temperature conditions	1
	3-6 Change of other site conditions, specially factors relevant for climatic conditions	1
4 Barrier and trap effect	4-1 Construction-related barrier or trap effect/loss of specimen	1
	4-2 Project/Installation-related barrier or trap effect/loss of specimen	1
	4-3 Operation-related barrier or trap effect/loss of specimen	1
5 Impacts not related to substances	5-1 Noise	2
	5-2 Optical effects	2
	5-3 Light	1
	5-4 Vibration	0
	5-5 Impact by mechanical effects	1
6 Impacts related to substances	6-1 Nitrogen and phosphate compounds related nutrient input	2
	6-2 Organic compounds	0
	6-3 Heavy metals	1
	6-4 Other pollutant substances arising from combustion or production processes	0
	6-5 Salt	0
	6-6 Depositions with structural impact (dust/suspended matter and sediments)	1
	6-7 Odour	2
	6-8 Medicament residues and endocrine active substances	2
	6-9 Other substances	0
7 Radiation	7-1 Non ionizing radiation/Electromagnetic fields	0
	7-2 Ionizing radiation/radioactive radiation	0
8 Targeted manipulation of species and organisms	8-1 Management of autochthonous species	0
	8-2 Supply and spread of alien species	1
	8-3 Control of organisms (pesticides)	1
	8-4 Release of genetically new or modified organisms	0
9 Other	9-1 Other	1

The user has to assess whether the individual item (species or LRT of the site) is really affected, e.g. by noise emission. If the emissions will not change or the LRT will not be reached the relevant fields may be ruled out so that the screening may end here.

8 SOME CONSIDERATIONS REGARDING PERMIT CONDITIONS

8.1 PERMIT CONDITIONS RELATED TO AVOIDANCE OF IMPACTS FROM AMMONIA

By taking appropriate measures to prevent or minimise impacts (e.g. from ammonia emissions and its deposition) on the protected site, likely significant effects on the habitat may be avoided. Mitigation should be taken into consideration within the initial planning phase of projects, although impacts identified during the permit determination will still need to be identified and implemented at this later stage to ensure no adverse effects. In practice, the applicant and their consultant will often use an iterative process to find a solution for optimising the project so that likely significant effects will not occur. Measures may include:

- reduction of the capacity of installations for rearing pigs and poultry (reduction of places),
- construction of the installation (e.g. gas proof cover on tanks, containers, basins for manure storage),
- procedural measures (e.g. acidification of manure through litter treatment),
- nitrogen (protein) adjusted feeding,
- preventive measures against nitrogen emissions into soil (e.g. outdoor area for free-range hens for production of bio eggs),
- use of scrubbers certified in procedures acknowledged by experts,
- retrofitting of installations with exhaust air cleaning systems (although this can often be an expensive option) and optimising the storage of manure – (for example storage beyond current and expected legal requirements),
- optimised spreading of manure / slurry application near Natura 2000 sites (for example, using injection techniques). Note that this choice would not be eligible as a reduction within the emissions of the permitted activity as in most cases, manure spreading is not counted as part of the permitted activity,
- choosing a proposal location of greater distance from the sensitive habitat(s).

The use of higher stacks (exhaust ducts/clean gas outlets) with dispersion over a greater distance and area is not a solution, simply because higher stacks will change and potentially increase negative effects over a wider area rather than reduce the overall impact of the emissions.

By integrating conditions related to ammonia emissions into the permits, authorities can ensure that all measures concerning ammonia necessary for compliance with the Habitats Directive are included. Defined limit values, monitoring requirements, regular maintenance, surveillance and additional measures are effective means for preventing pollution and adverse effects caused by industrial installations.

There are permit conditions regulating the reduction of ammonia emissions like those concerning feeding and manure storage that apply to all sizes of installations and those for intensive rearing of poultry or pigs. Operators of big projects or, if necessary, also of smaller ones have to use air cleaning systems. Generally the permit conditions refer to the farm project itself. If this is not sufficient, conditions for minimising the impacts on the Natura 2000 site(s) or protected species in the vicinity of the installation might be fixed in the permit that regulate measures directly on the protected site (see section 8.2).

A project may have no likely significant effects on the Natura 2000 site either because the distance is too great for impacts to be encountered or that technical measures implemented within the project are sufficient to avoid impacts. In these cases the normal environmental permit conditions with emission limit values (ELVs), monitoring and reporting obligations are sufficient.

A permit for a pig or poultry farm is complex and contains a number of different conditions for reduction of emissions, especially ammonia emissions. Only some examples will be mentioned here.

8.1.1 PERMIT CONDITIONS RELATED TO AIR SCRUBBERS

In countries with high numbers of pig and poultry farms the use of air scrubbers has considerably increased during the last years, especially in the Netherlands, Germany, Denmark and Belgium. A reduction of ammonia emissions of up to 95 % is possible. If scrubbers are used to minimise nitrogen deposition, odour and dust from installations for rearing pigs and poultry, permit conditions shall become part of the permit to assure continuously the correct functioning.

THE APPROACH OF THE PROVINCE OF BRABANT (NL)

In 2012 the province of Brabant decided to introduce the requirement of electronic monitoring with permanent automatic sampling and registration for the air scrubbers. For new installations it applies immediately and existing farms needed to be equipped by 1 January 2016. Parameters to be recorded according to the permits: acidity, use of electricity of pumps, conductivity of wash water and production of waste water. Authorities and farm managers have permanent insight into the working of these installations. On top the inspection authorities took further initiatives to improve compliance.

THE REQUIREMENTS IN LOWER-SAXONY (DE) AND SCHLESWIG-HOLSTEIN (DE)

For ensuring that all authorities work with the same requirements Lower-Saxony has issued the following decree "Exhaust Air Cleaning Systems for Installations of Intensive Rearing of Pigs and Poultry and Requirements Concerning the Bioaerosol Problem" [Niedersächsisches Ministerialblatt Nr. 36 vom 23.9.2015, S. 1226]. The authority has to integrate the requirements into the permit or to issue a subsequent order has to be issued for existing plants

General condition: The operator has to install an air cleaning system that has been tested in the prescribed procedure called "Testing of air cleaning systems for intensive livestock

farming". The minimum cleaning performance has to comply with the requirements of Table 8.1.

Table 8.1: Minimum requirements for the cleaning performance of air cleaning systems.

Parameter	Minimum requirement	Remarks
Ammonia	70 %	Half-hour average > 70 %
N-reduction	70 %	In summer and in winter
Total dust concentration	70 %	Each value above 70 %
PM 10 and PM 2,5 (option)*	70 %	Each value above 70 %
Odour	Max. 300 odour units/m ³ in the clean gas, n.r.p.**	Each value Each value
Bioaerosols (option)***		
Total bacteria count, 25 °C	70 %	Each value
Mesophilic fungi, 25 °C	70 %	Each value

*only for pig farming

** no odour of raw gas perceptible in the clean gas

***the manufacturer can decide whether he includes these values into the test report; if it is put in, the minimum requirements are valid

Condition 2: The operator must keep an electronic diary covering the following considerations:

- energy consumption of the exhaust air treatment system (kWh per animal place and year and cumulative (kWh),
- consumption of liquids, if relevant (fresh water, acids, alkaline solutions, additives in relation to the animal place and cumulative,
- fresh water (always) and sludge removed (wet scrubbers) in relation to the animal place and cumulative,
- volume flow rate (m³/h or %),
- raw gas temperature and moisture (°C, %),
- clean gas temperature and moisture (°C, %),
- differential pressure of the air cleaning system [Pa],
- pH level and conductivity for scrubbers and multi-stage systems,
- volume of circulated wash water.

Condition 3: The operator has to keep a written diary which contains the number of animals, the date of stabling/arrival, the number and weight of the animals per week and information about unexpected incidents, like power outage/blackout.

Condition 4: After starting the operation and a change of the air cleaning system and every three years the compliance with the emission limit values has to be proved by an accredited expert. The testing has to be carried out at phases of maximum emissions.

Alternative to condition 4:

The periodic testing of the air cleaning system can be abandoned if a laboratory, accredited according to DIN EN ISO/IEC 17025 for odour and ammonia emissions carries out a regular

check of the correct operation of the air cleaning system (so called check-up). The minimum scope of the check includes:

- check whether the air cleaning system has been operated according to the permit (for this purpose an evaluation of the electronic diary is carried out),
- the check has to be carried out annually,
- the check includes at least the assessment of the following parameters:
 - raw gas moisture,
 - ammonia reduction,
 - assessment whether odour of raw gas is perceptible in the clean gas.

The assessment of the electronic diary shall include the following items:

- plausibility of the fresh water consumption,
- plausibility of the electricity consumption,
- compliance with the pH level,
- compliance with the conductivity value,
- plausibility of the desludging rate,
- plausibility of volume flow rate and differential pressure of the air cleaning system and
- time of use of the filter material of biofilters.

The operator must submit the results of the annual check to the competent authority within one month after the check. Further information concerning the check-up can be found under http://www.lkclp.de/uploads/files/ara_checkup_funktionstest_hinweise_zum_ausfuellen_der_protokolle.pdf.

Condition 5: The operator must submit a copy of his maintenance contract to the competent inspection authority before the start of the operation. Changes of the maintenance contract have to be notified to the authority.

Condition 6: At least once per year maintenance of the air cleaning system has to be carried out by the manufacturer or an authorized company.

In Schleswig-Holstein the permit authority integrates similar conditions into the permit.

8.1.2 PERMIT CONDITIONS RELATED TO ON SITE STORAGE OF MANURE

Condition 1: Storage of solid manure: The dried solid manure has to be stored in a barn.

Condition 2: Slurry store: Emissions (ammonia, odour) from the slurry tank has to be minimised by a solid cover.
Alternative: The emissions from the slurry tank have to be reduced by 90 %, e.g. by using a solid cover or a tent roof.

Condition 3: Liquid manure must be led into the storage tank below the surface level.

Condition 4: Liquid manure or slurry may be removed from the storage tank only on a paved surface. Solid tapping places must be cleaned.

8.1.3 PERMIT CONDITIONS RELATED TO NUTRIENT ADAPTED FEEDING

The application of multiphase nutrient-adapted feeding may lead to 20 % reduction of ammonia emission.

Condition 1: Example fattening pigs - An at least threephase feeding for fattening pigs with a diet formulation adapted to the specific requirements of the production period (raw protein and phosphor) has to be applied. The BAT-associated

- total nitrogen excreted of 9,8 kg N and excreted per animal place and per year and
- total phosphor of 3,9 kg P₂O₃ and excreted per animal place and per year for fattening pigs may not be exceeded.

(with reference to the BAT conclusions (BAT 3 and 4) for the intensive rearing of poultry or pigs (C(2017)688))

8.2 PERMIT CONDITIONS RELATED TO INTEGRATED PROJECTS:

“Integrated project” means that the project includes measures to avoid significant effects on nearby Natura 2000 sites from the beginning. Section 6.2 describes the options for integrating other avoidance measures into the project. Once the conditions are included within the permit, the competent authority must ensure that the measures are implemented and monitored throughout and post-operation. There are a large number of possible scenarios for measures which may be implemented at intensive farming sites, and therefore only a few examples of such conditions can be noted here.

8.2.1 CHANGE TO EXTENSIVE PASTURING

The permit can include conditions concerning the number (animal units) per ha and the species (cattle, sheep, goats etc.). The farmer must keep a diary about the date of arrival, the number of the animals per week and their leaving.

8.2.2 WITHDRAWAL/ABSTRACT OF BIOMASS

Time period and frequency of mowing and harvesting the biomass should be fixed in the permit. The farmer has to keep a diary about the date of carrying out the measure.

8.2.3 REDUCTION OF AGRICULTURAL EMISSIONS FROM SPREADING OF MANURE

The permit should include conditions concerning the kind of manure (liquid, solid, mineral), the total amount and the technique for applying it. If necessary, the size of buffer zones (strips) at field borders have to be defined. The farmer has to keep a diary about the date of application, the technique and the amount. (He has to do this kind of bookkeeping under the requirements of agricultural law anyway).

9 INSPECTION

In order to manage and reduce emissions of ammonia and consequently, manage and reduce nitrogen (and acid deposition), competent authorities must undertake regular inspections of pig and poultry farms to ensure compliance with their permits. The scope of this chapter on inspections constitutes an approach to environmental inspections of pig or poultry farms. It explores only some specific impacts on nature and biodiversity considered in permit conditions. Its main purpose is ensuring compliance with permit conditions (item (1)). For item (2) “undertaking site visits to relevant Natura 2000 locations” the project team proposes future IMPEL projects on this subject.

There are a clear number of steps which must be undertaken to ensure a successful and sufficient inspection of an agricultural permitted site. This chapter endeavors to highlight the steps required. To a certain degree the focus is put on protected sites / Natura 2000 sites and activities that may have impacts. The basic scheme can be adjusted to all kinds of farms, to small pig or poultry farms as well as to big ones. This chapter provides the basic information on environmental inspections with focus on protected sites. Annex III to this report contains a detailed description with valuable information for practitioners.

Inspections include the following steps:

- a) Preparation of the inspection
- b) On-site inspection
- c) Inspection Reporting
- d) Follow-up measures

This chapter describes the steps in a general way. Full information is available in ANNEX III to this document.

9. 1 PREPARATION BEFORE INSPECTION

9.1.1 DETERMINE TYPE/DURATION OF INSPECTION

An inspection team shall decide on the type of inspection and on the resources, including staff and equipment, which will be assigned to the task. Inspections can be routine coverage of all production processes or be targeted to problematic areas on the basis of complaints or in case that there are indications that critical emission limit values (ELV) – or requirements concerning protected sites - cannot be met.

9.1.2 DESK STUDY

The collection and evaluation of existing information about the installation is critical for the success of the inspection since it allows the easier formulation of targeted questions for the operator and the targeted investigation of operations showing the highest potential for not

complying with the conditions. If conditions concerning protected sites are included in the permit, the competent nature conservation inspector should be contacted and, if possible, a joint inspection should be carried out.

Examples of information to be collected across all installations include the following:

- reports of previous inspections of the site,
- records of incidents/accidents and evidence of communication by the operator to competent authorities,
- maps showing the Natura 2000 site with the installation in a geographical context,
- updated maps of the installations with all its elements (e.g. housing, manure storage, manure treatment),
- list of habitat types and species for which Natura 2000 site was designated for
- status of natural habitats and species for which Natura 2000 site was designated (favourable / not favourable),
- where available, a copy of the Environmental Impact Assessment / Appropriate Assessment (decision, study, monitoring plan, monitoring reports),
- application for the permit,
- copies of all environmental permits (IED, water discharge, hazardous waste storage),
- copies of permits from other competent authorities if available (for example building and planning permissions and agriculture authorities if applicable),
- environmental reports submitted by operators, including monitoring reports and certificates provided by accredited laboratories,
- a history of any complaints received,
- PRTR and other registers such as register of polluting substances into air, register of waste producers and managers,
- information on installation to be inspected received from other competent authorities,
- information available on the website of the operator.

For the effective inspection site visits, inspecting officers should also be clear on the following:

- the identification of each housing unit in the installation,
- boundaries of the installation,
- if any sensitive receptors are nearby (like protected habitat types, species),
- if any non-farming (such as recreation) activities are present,
- which type and amount of animals are present in each unit.

9.1.3 TEMPLATES FOR AGENDA OF THE INSPECTION AND CHECKLIST

Based on the information collected the inspector should prepare a comprehensive questionnaire for the operator's interview. A sector checklist template should be in place in each inspection authority for pig and poultry farms. This sector checklist should be easily adaptable to each installation and to the conditions laid down in the permit.

9.2 ON-SITE INSPECTION

9.2.1 GENERAL CONSIDERATIONS TO TAKE INTO ACCOUNT

The aim of the inspection will be to check compliance of the operator with the operating/environmental conditions set in the issued permit.

1. Inspectors must identify themselves. At the beginning of each inspection they must introduce themselves, and show their identification cards and explain the purpose of the visit.
2. The conditions set in the permit will provide the main driver for focus throughout the inspection.
3. If necessary inspectors may take samples, and/or define the samples that should be taken by an accredited laboratory. Note that the taking of samples must be in line with permit and warranted procedures for the member state in question.
4. Everything found during inspections should be treated as evidence (in line with warranted procedures for the member state) and must be attached to the report.

9.2.2 BEST AVAILABLE TECHNIQUES (BATs)

BATs that are prescribed in the permit must be checked for their applicability and presence, and that the corresponding emission values are met.

9.2.3 MAIN QUESTIONS FOR INSPECTION

The major points of interest for inspection for the activities related to pig and poultry farms are the following:

- nutritional management
- housing, especially emissions to air and emissions to water
- manure storage, especially emissions to air and emissions to soil, water and groundwater
- on farm manure processing, especially emissions to air and water
- on farm manure application, especially emissions to air and emissions to soil, water and groundwater
- waste water treatment
- storage of dead animals
- storage of hazardous and non-hazardous waste
- monitoring, especially of total nitrogen and phosphorus excreted in manure, emissions to air, process parameters, emissions to surface water

9.3 AFTER THE INSPECTION

9.3.1 INSPECTION REPORTING

After the inspection, according to EU best practices, the inspector has to draft a final inspection report. A template for such report must be in place in each inspection authority. The main contents of such a report are:

a) basic data on the inspection including scope of the inspection (e. g. integrated inspection, media that were inspected, parts of the installation that were inspected) and kind of inspection (regular, extraordinary, control).

b) inspection's results

- no or only minor non-compliances,
- significant or relevant non-compliances,
- serious or important non-compliances.

c) recommended corrective measures

- minor corrective measures,
- significant or major corrective measures,
- serious or important corrective measures.

9.3.2 INSPECTION RECORDING

The inspection report and any other additional material used for the preparation of the inspection should be stored and made accessible to any relevant authorities for their information.

9.4 FOLLOW-UP MEASURES

After the inspection, depending on the degree of non-compliance and the kind of corrective measures recommended different actions may be necessary:

- issuing a letter to the company ;
- informing other inspecting bodies;
- planning a follow-up inspection;
- fixing of fines;
- subsequent order;
- criminal or non-criminal follow-up.

ANNEX I SCREENING CHECK LIST (SCHLESWIG-HOLSTEIN, DE)

Screening check list acc. to Art. 6(3) Habitats Directive – General information
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1. General Information for all kinds of projects

1.1. Name and address of the project:

1.2. Type of project

1.3. General information on the project (capacity, type of stable(s), storage of manure, transport)

1.4. Location of the project?

outside Natura 2000 sites

Inside one or several Natura 2000 sites

Pipe(s) inside the site(s) or crossing

Open electric wire(s) inside the Natura 2000 site(s) or crossing

1.5. Natura 2000 sites potentially affected by the project:

	Number/ identifier of the site	Name of the site	Notification date	Conservation? objectives	Distance to the project
1.2.1.					
1.2.2.					
1.2.3.					
Xxx					

Please fill in a separate form 2 for each of the sites mentioned in 1.4

Screening check list acc. To Art. 6(3) Habitats Directive – impacts

2. Identification of possible impacts of the farm project on the individual site³⁶

2.1. Possible effects due to the project / the installation		
	Impact	Description / explanation of the effects/ site related
2.1.1	<input type="checkbox"/> Habitat loss (directly within the site) soil sealing, sealed natural ground	
2.1.2	<input type="checkbox"/> Site conversion / land conversion (in the vicinity / close to the site too)	
2.1.3	<input type="checkbox"/> Fragmentation of Natura 2000 habitats	
2.1.4	<input type="checkbox"/> Trap effect, collision, barrier effect	
2.1.5	<input type="checkbox"/> Change of water and groundwater regime	
2.1.6	<input type="checkbox"/> Storage of waste	
2.1.7	<input type="checkbox"/> Impacts through buildings for abstraction or discharge of water	
2.1.8	<input type="checkbox"/> Others (please explain)	
2.2. Impacts due to the operation of the installation		
	impact	Description / explanation of the effects/ site related
2.2.1	<input type="checkbox"/> Deterrence, collision	
2.2.2	<input type="checkbox"/> Emission of substances	
2.2.3	<input type="checkbox"/> Vibrations	
2.2.4	<input type="checkbox"/> Acoustic impacts / noise	
2.2.5	<input type="checkbox"/> Light	
2.2.6	<input type="checkbox"/> Discharge into surface water	
2.2.7	<input type="checkbox"/> Impacts through abstraction of water	
2.2.8	<input type="checkbox"/> Odour (e.g. relevant concerning attraction of bears, wild animals)	
2.2.9	<input type="checkbox"/> Others (please explain)	

2.3 Temporary impacts due to building activities		
	Impact	Description / explanation of the effects/ site related
2.3.1	<input type="checkbox"/> Soil sealing (e.g. through construction compound)	

³⁶ To be submitted by the proponent / the consultant of proponent and assessed by the authority

2.3.2	<input type="checkbox"/>	Emission of substances	
2.3.3	<input type="checkbox"/>	Acoustic effects	
2.3.4	<input type="checkbox"/>	Vibrations	
2.3.5	<input type="checkbox"/>	Change of water and groundwater regime (e.g. by lowering ground water level)	
2.3.6	<input type="checkbox"/>	Others (please explain)	

2.4 Cumulative effects [There are different opinions about this point. Does it belong to Screening? As it produces really hard efforts and extra information is needed, there is the following view: As soon as the assessment of cumulative effects is necessary, an appropriate assessment has to be carried out.]

Will the project – in combination with other plans or projects (that were carried out after the notification of the site or will be carried out in near future and are already licensed) - likely have a significant effect on one or several Natura 2000 sites?

no, there are no cumulative effects.

yes

→ If yes: Please fill in the following table:

	In combination with which other projects or plans may the project have a significant effect on a site? Please fill in the name of the project(s), location(s).	Description / Explanation of impacts / impact factors /disturbances
2.4.1		
2.4.2		
2.4.3		
...		

2.5 Explaining documents (e.g. maps, balance sheets, expert opinions etc.)

Explanations about prevention and mitigation measures, which influence the overall balance.

2.6 Remark

If, based on the described impacts of the project (in combination with other projects or plans) significant effects cannot be excluded or if doubts remain, an Appropriate Assessment according to Art. 6 (3) has to be submitted.

ANNEX II ASSESSMENT OF IMPACTS OF NITROGEN DEPOSITION – THE GERMAN APPROACH (DETAILED EXPLANATION)

Long-time exposure to nitrogen deposition may lead to changes in species composition even with low doses. In the scientific world “critical loads” have been established to describe the sensitivity of natural habitats to eutrophying and acidifying impacts of nitrogen deposition.

Within the EU a consensus has been reached to apply critical loads in the assessment of nitrogen deposition impacts of new plans and projects under the Habitats Directive. Due to a number of publications in the technical literature, restrictive court decisions and increasingly well founded data e.g. in respect to background deposition, nitrogen deposition is meanwhile carefully examined within appropriate assessments for a range of project types in Germany. However, so far there has been no commonly accepted methodological convention in this field.

End of 2013 the German Federal Ministry for Transport and Housing Road Construction published the “Untersuchung und Bewertung von Straßenverkehrsbedingten Nährstoffeinträgen in empfindliche Biotope” [research and development-project 84.0102.2009, abstract:

[http://www.bast.de/DE/Verkehrstechnik/Publikationen/Download-](http://www.bast.de/DE/Verkehrstechnik/Publikationen/Download-Publikationen/Downloads/V-Naehrstoffeintrag.html)

[Publikationen/Downloads/V-Naehrstoffeintrag.html](http://www.bast.de/DE/Verkehrstechnik/Publikationen/Download-Publikationen/Downloads/V-Naehrstoffeintrag.html), long version: Heft 1099, ISBN: 978-3-95606-036-6;]. Included are proposals how to assess background deposition and project contributions, how to determine sensitivity of Natura 2000 habitats and annex II plant species to nitrogen deposition, how to distinguish irrelevant and relevant contributions, how to determine adverse effects and how to plan, evaluate and distinguish mitigation and compensation measures. Based on this the “Guidance on the Assessment of Nitrogen Depositions in the Appropriate Assessment for Road Projects” has been developed.

Methodology

The study started with gathering available scientific knowledge and methodological approaches described in technical publications and other literature. Among others this concerned empirical knowledge about the effects of nitrogen deposition on plants, best available technology on modelling pollutant transport and deposition of emissions of nitrogen compounds by cars or available data sources for site specific estimations of background deposition. On the base of available knowledge, but also of practical experiences with appropriate assessments gained during the time of research, methodological recommendations have been put forward as proposals for an expert convention.

To determine representative ranges of potentially relevant nitrogen depositions exemplary dispersion and deposition calculations have been conducted with the modelling system LASAT. Literature research was undertaken on the limits of detection of nitrogen deposition to provide supporting arguments for an appropriate threshold of irrelevance.

In order to quantify sensitivity of distinguished features of SACs against nitrogen deposition more specifically, critical loads for most of the Natura 2000 habitat types and annex II plant species in Germany have been calculated for both eutrophying and acidifying effects. The basic

principles and standards for modelling critical loads are compiled in the mapping manual of the International Cooperative Programme (ICP) Modelling & Modelling (<http://www.icpmapping.org>). Essentially models are derived into dynamic and steady state models. Within the R&D project a combination of the largely standardized SMB model (Simple Mass Balance) of the mapping manual (ICP M&M) and the BERN model of ÖKO-DATA considering responses of vegetation respectively species to changes in site conditions was deployed.

Results

In the course of the study, site specific critical loads for eutrophying and acidifying effects have proved to be well suited for evaluating impacts by nitrogen deposition in appropriate assessments under the Habitats Directive.

To consider road project contributions only dry depositions of nitrogen have been taken into account. Those may be calculated by using standard pollutant dispersion models and receptor specific deposition velocities. Currently the values of the VDI guideline 3782 (5) are considered to be the standards to be applied.

In order to assess background deposition data of 2007 published online (April 2011) by the UBA (Federal environmental agency) are available, representing the best scientific knowledge (<http://gis.uba.de/website/depo1/> - German only). This set of data shows overall nitrogen deposition (wet, dry and occult deposition) for all of Germany with the resolution of 1 x 1 km² for nine different receptor classes. However, because emission data have been projected on a grid of 7 x 8 km², major single contributions with steep gradients may lead to an underestimation of background deposition in their vicinity. If relevant, for evaluation of effects, such particular cases have to be considered.

As a principle, likely significant effects may occur, if project contributions are not irrelevant and predicted environmental deposition exceeds the significant habitat specific critical load. In that case a risk has to be assumed that adverse effects may happen on the short, middle term or long run. In order to judge adverse effects a well-founded assessment of site, habitat and vegetation type, specific critical loads are needed to accurately describe the sensitivity of the effected designated feature. Only in the case where no relevant critical load can be determined, the test on adverse effects may be performed in another way on a single case basis.

To determine relevant critical loads for nitrogen deposition and acidification, either empirical data derived from field or laboratory experiments or data calculated with the aid of modelling may be used.

The study aimed at modelling a large number of vegetation associations and site parameter combinations (e.g. soil, parent rock material, base cation availability, trophic level) that may occur with the various habitat types to reduce insecurities that are encountered in the European list of critical loads. As a result it should be possible to determine a value of critical loads as specific as possible without the need of modelling each single case. By comparing the outcomes of the model runs with empirical values, weaknesses in empirical and modelling data

could be identified and improvements of the model implemented. **Table II.1** shows the results of the model runs in an aggregated form.

Table II.1: Ranges of critical loads for Natura 2000 designated habitat features calculated with the BERN/SMB modelling system

Habitat	Name of habitat	CL (N) from	CL (N) to
2110	Embryonic shifting dunes	10	12
2120	Shifting dunes along the shoreline with <i>Amophila arenaria</i> ("white dunes")	7	12
2130	*Fixed coastal dunes with herbaceous vegetation ("grey dunes")	7	7
2140	*Decalcified fixed dunes with <i>Empetrum nigrum</i>	10	11
2150	*Atlantic decalcified fixed dunes (<i>Calluno Ulicitea</i>)	9	19
2160	Dunes with <i>Hippophaë rhamnoides</i>	5	11
2170	Dunes with <i>Salix repens</i> ssp. <i>Argentea</i> (<i>Salicion arenariae</i>)	4	19
2180	Wooded dunes of the Atlantic, Continental and Boreal region		
2310	Dry sand heath with <i>Calluna</i> and <i>Genista</i>	8	26
2320	Dry sand heath with <i>Calluna</i> and <i>Empetrum nigrum</i>	12	13
2330	Inland dunes with open <i>Corynephorus</i> and <i>Agrostis</i> grasslands	5	24
4010	Northern Atlantic wet heaths with <i>Erica tetralix</i>	6	16
4030	European dry heaths	8	21
4050	Alpine and Boreal heaths	7	19
4070	*Bushes with <i>Pinus mugo</i> and <i>Rhododendron hirsutum</i> (<i>Mugo-Rhododendretum hirsuti</i>)	18	18
5110	Stable xerothermophilous formations with <i>Buxus sempervirens</i> on rock slopes (<i>Berberidion</i> p.p.)	11	14
5130	<i>Juniperus communis</i> formations on heaths or calcareous grasslands	8	30
6110	*Ropicolous calcareous or basophilic grasslands of the <i>Alyso-Sedion albi</i>	7	33
6120	*Xeric sand calcareous grasslands	11	21
6212	Semi-natural dry grasslands and scrubland facies on calcareous substances (<i>Festuco-Brometalia</i>) (*important orchid sites)	13	28
6213	Semi-natural dry grasslands and scrubland facies on calcareous substances (<i>Festuco-Brometalia</i>) (*important orchid sites)	12	30
6214	Semi-natural dry grasslands and scrubland facies on calcareous substances (<i>Festuco-Brometalia</i>) (*important orchid sites)	13	35
6230	*Species-rich <i>Nardus</i> grasslands, on silicious substrates in mountain areas in Continental Europe)	10	24
6240	*Sub-Panonic steppic grasslands	14	33
6410	<i>Molinia</i> meadows on calcareous peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>)	12	36
6431	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	15	77
6432	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	11	28
6440	Aluvial meadows of river valleys of the <i>Cnidon dubii</i>	16	58
6510	Lowland hay meadows (<i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i>)	12	43
6520	Mountain hay meadows	17	26
7110	*Active raised bogs	5	23
7120	Degraded raised bogs still capable of natural regeneration	5	23
7140	Transition mires and quaking bogs	6	26
7150	Depressions on peat substrates of the <i>Rhynchosporion</i>	7	17
8110	Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>)	11	23
8120	Calcareous and calcshist screes of the montane to alpine levels (<i>Thlaspietia</i>)	10	23

Habitat	Name of habitat	CL (N) from	CL (N) to
	rotundifolii)		
8150	Medio-European upland siliceous scree	5	22
8160	*Medio-European calcareous scree of hill and mountane levels	5	15
8210	Calcareous rocky slopes with chasmophytic vegetation	7	23
8220	Siliceous rocky slopes with chasmophytic vegetation	4	25
8230	Siliceous rock with pioneer vegetation of the Sedo-Scleranthion or of the Sedo albi-Veronicion dillenii	6	17
9110	Luzulo-Fagetum beech forests	10	21
9120	Atlantic acidophilous beech forests with liex and sometimes also Taxus	8	17
9130	Asperulo- Fagetum beech forests	9	22
9140	Medio-European subalpine beech woods with Acer and Rumex arifolius	15	27
9150	Medio-European limestone beech forests of the Cephalanthero-Fagion	13	23
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli)	14	21
9170	Galio-Carpinetum oak-hornbeam forests	11	23
9180	*Tilic-Acerion forests of slopes scree and ravines	8	30
9190	Old acidophilous oak woods with Quercus robur on sandy plains	8	14
91D0	*Bog woodland	7	28
91E0	*Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	6	28
91F0	Riparian mixed forests of Quercus robur and Ulnus minor, Fraxinus excelsior or Fraxinus angustifolia (Ulmenion minoris)	11	31
91G0	*Pannonic woods with Quercus petraea and Carpinus betulus	15	24
91T0	Central European lichen pine forests	4	13
91U0	Carmatic steppe pine forests	6	18
9410	Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetea)	11	27
9420	Alpine larix decidua and/or Pinus cembra forests	11	36
9430	Subalpine and montane Pinus uncinata forests (*if on gypsum or limestone)	12	29

The assessment scheme depicted in **figure II 1** is proposed to test project contributions of nitrogen depositions for adverse effects on the integrity of a Natura 2000 habitat. As mentioned above, only Predicted Environmental Deposition above the critical loads are subject to further examinations. A de minimis value of 0,3 kg N ha⁻¹ a⁻¹ is proposed as threshold of irrelevance for project contributions.

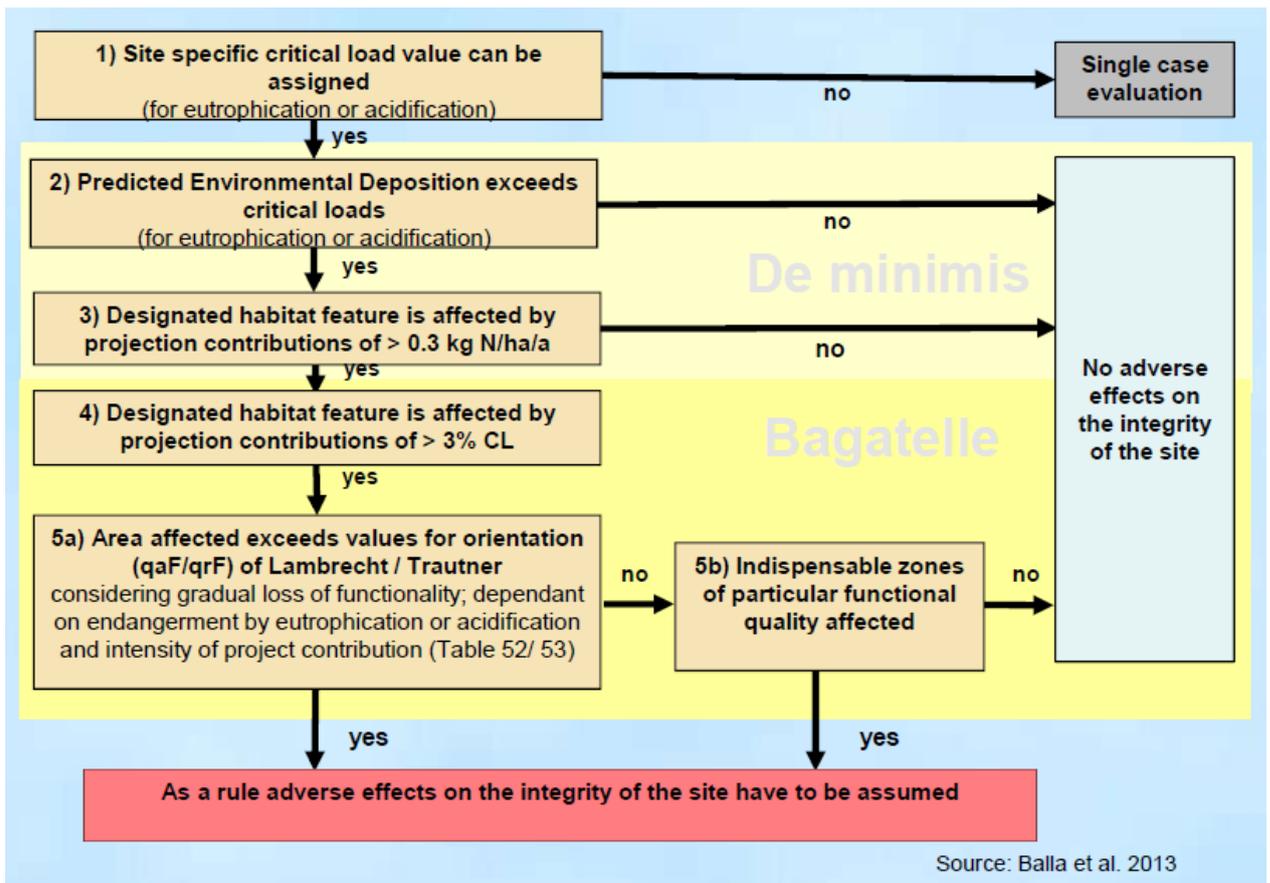


Figure II.1: Assessment scheme to test project contributions of nitrogen depositions for adverse effects on the integrity of a Natura 2000 SAC on the base of critical loads

Up to that threshold contributions are not detectable by measurements; on the other hand they have never proven to exert effects by their own. They cannot be to a single source. According to the principles of common sense and proportionality they do not have to be assessed. In contrast, values of project contributions above that level (i.e. PC of $0,4 \text{ kg N ha}^{-1} \text{ a}^{-1}$ and above) have to be further examined and are also subject to an in combination test for adverse effects on the integrity. If project contributions are more than 3 % of the critical loads, adverse effects on the integrity of a site may be ruled out only under certain circumstances. Considerations include the area affected, intensity of deposition and sensitivity of the affected habitat. Both R&D report and the draft manual contain evaluation schemes to assess tolerable sizes of affected areas.

Project contributions may be minimized by a number of mitigation measures. In order to be counted as such their effect must be highly reliable, securing full functionality of the habitats affected without time lag. If the areas affected by relevant project contributions are not identical with those covered by mitigation measures, there has to be a tight coherence between the habitats both in terms of spatial relationship and comparable quality. Recommendations are given how output of nutrients can be optimized by habitat compatible land use, thus raising critical loads and reducing sensitivity to nutrients within a certain range.

ANNEX III: INSPECTION OF PIG OR POULTRY FARMS

1 PREPARATION BEFORE INSPECTION

There are a clear number of steps which must be undertaken to ensure a successful and sufficient inspection of an agricultural permitted site. Required steps are highlighted:

1.1 DETERMINE TYPE/DURATION OF INSPECTION

An inspection team shall decide on the type of inspection and on the resources, including staff and equipment, which will be assigned to the task. Inspections can be routine coverage of all production processes or be targeted to problematic areas on the basis of complaints or in case that there are indications that critical emission limit values (ELV) cannot be met.

The following aspects should be taken into account for all installation inspections:

- complexity and duration of the installation - the more complex the situation, the more inspectors or time on site that may be required,
- time of inspection - for safety reasons it is recommended that if an inspection is required at night two inspectors should be in attendance,
- for non-routine inspections, especially those conducted upon a complaint and problematic situation, it is advisable to direct two inspectors attend,
- weather and other seasonal conditions - some additional equipment might be needed (e.g. torches, protective clothes, etc.) as wet conditions may result in increased levels of mus on site,
- a check-list of the equipment needed before visiting site is recommended (including safety gear, sampling equipment in case sample taking is required or under the inspectors jurisdiction, laptop if available and convenient).

1.2 DESK STUDY

The collection and evaluation of existing information about the installation is critical for the success of the inspection since it allows the easier formulation of targeted questions for the operator and the targeted investigation of operations showing the highest potential for not complying with the conditions. If permit conditions concerning protected sites are included in the permit, the competent nature conservation inspector should be contacted and, if possible, a joint inspection should be carried out

Examples of information to be collected across all installations include the following:

- reports of previous inspections of the site,
- records of incidents/accidents and evidence of communication by the operator to competent authorities,
- maps showing the Natura 2000 site(s) with the installation in a geographical context,
- updated maps of the installations with all its elements (e.g. housing, manure storage, manure treatment),
- list of habitat types and species for which Natura 2000 site was designated for
- status of natural habitats and species for which Natura 2000 site was designated (favourable / not favourable),

- where available, a copy of the Environmental Impact Assessment / Appropriate Assessment (decision, study, monitoring plan, monitoring reports),
- application for the permit,
- copies of all environmental permits (IED, water discharge, hazardous waste storage),
- copies of permits from other competent authorities if available (for example building and planning permissions and agriculture authorities if applicable),
- environmental reports submitted by operators, including monitoring reports and certificates provided by accredited laboratories,
- environmental Management System (EMS) certificate (if applicable),
- a history of any complaints received,
- knowledge of the BREF (2015),
- PRTR and other registers such as register of polluting substances into air, register of waste producers and managers,
- information on installation to be inspected received from other competent authorities,
- information available on the website of the operator.

For the effective inspection site visits, inspecting officers should also be clear on the following:

- the identification of each housing unit in the installation,
- boundaries of the installation,
- if any sensitive receptors are nearby (like protected habitat types, species),
- if any non-farming (such as recreation) activities are present,
- which type and amount of animals are present in each unit:
 - Poultry:
 - Production of eggs: laying hens, pullets
 - Broilers for meat production
 - Other: broiler breeders, turkeys, ducks and guinea fowl;
 - Pigs:
 - Breeding sows: mating, gestating and farrowing sows
 - Fattening pigs: weaners, growers/ finishers.
- which type of housing is used for each type of animals:
 - Poultry:
 - Production of eggs:
 - cage systems
 - non-cage systems:
 - deep litter systems
 - aviary systems and the capacity of each housing type in animal places in each identified unit
 - Production of broiler meat: simple closed-building constructions
 - Other
 - Pigs:
 - Breeding sows:
 - Mating and gestating sows:
 - Individual housing with fully or partially slatted floor
 - Sow crates with a solid floor

- Group housing with or without straw
- Group housing with electronic breeders
- Farrowing sows:
 - With confined movement
 - Allowing movement
- Fattening pigs:
 - Weaners:
 - Conventional pens with partly or fully slatted floors
 - Flat decks (raised pens).
- Growers/finishers

On the basis of the information collected, it is recommended that the inspecting officer should prepare the following:

- a comprehensive questionnaire which will be used for the operator's interview,
- a check list to facilitate the inspection (see next subsection),
- a table or spreadsheet similar to that below (if not already available in the permit),
- an outline of the critical emission limit values (ELV's) (i.e. those parameters which significantly contribute to the pollution load coming out of the installation),
- the list of best available techniques (BAT) (according to the issued permit) which the operator should have installed and operated,
- the list of documentation to be provided by the operator (e.g. self-monitoring records, annual reports submitted to the authorities ...),
- the inspection minutes and report templates (tailor-made for the installation) to be filled in at the end of the inspection,
- a clear agenda of the inspection to avoid missing any relevant aspect.

1.3 TEMPLATES FOR AGENDA OF THE INSPECTION AND CHECKLIST

A sector checklist template should be in place in each inspection authority for pig and poultry farms. This sector checklist should be easily adaptable to each installation and to the conditions laid down in the permit by adding items and rows, for instance with the BAT implemented specifically in the installations as set in the permit. Time should be dedicated to the elaboration of the specific checklist for the installation to be inspected since it makes much easier to carry out the site visit and allows information to be collected in a systematic way. The development of IT tools for the automatic output of specific checklist based on the permit issued for the installation should be encouraged to spare time and avoid mistakes.

Table 9.1: Template for checklist – Existing information.

Installation (name/address)					
Type of permit for operating					
Natura 2000 site (name/identification number)					
List of habitat types/species for which N2 site was designated for					
Status of Natura 2000 site					
Boundaries of the installation					
Nearby of sensitive receptors (protected habitat types, species)					
Nearby of any non-farming activities (such as recreation)					
Other					
	1	2	3	4	5 ...
Unit (all units of the installation)					
Animal category					
No of places					
Housing type					
Type of feeders					
Type of drinkers					
Feed formulation					
Type of floor/manure removal technique					
Type of ventilation and dust control system					
Heating & cooling system/temperature control system					
Lighting					
Air abatement system					
Cleaning system/wash-down water collection & treatment					
Other					

1.4 PRIOR OPERATOR NOTIFICATION

- Routine inspections. The operator shall be previously notified of routine inspections as provided in the applicable legislation.
- Non-routine inspections. There is no obligation to notify operators of non-routine inspections. Therefore, in case of inspections carried out to verify if the operator is in line with environmental regulations, as a consequence of complaints by citizens or for other reasons, it is not recommended to notify operators previously.

2 ON-SITE INSPECTION

2.1 GENERAL CONSIDERATIONS TO TAKE INTO ACCOUNT

The aim of the inspection will be to check compliance of the operator with the operating/environmental conditions set in the issued permit.

1. Inspectors must identify themselves. At the beginning of each inspection they must introduce themselves, and show their identification cards and explain the purpose of the visit.
2. The conditions set in the permit will provide the main driver for focus throughout the inspection.
3. If necessary inspectors may take samples, and/or define the samples that should be taken by an accredited laboratory. Note that the taking of samples must be in line with permit and warranted procedures for the member state in question.
4. Everything found during inspections should be treated as evidence (in line with warranted procedures for the member state) and must be attached to the report. Generally as "evidence" it is understood:
 - photographs, videos,
 - oral and written statements of the operator and the employees,
 - reports of sampling as well as reports from laboratory analysis,
 - notes/reports of visual inspection,
 - documents such as environmental reports, registries, results of self-monitoring. In case of infringements it is worth making copies and attaching them to the report, as they will serve as a proof in case of later proceedings,
 - protocols of interrogations.

2.2 BEST AVAILABLE TECHNIQUES (BATs)

BATs that are prescribed in the permit must be checked for their applicability and presence, and that the corresponding emission values are met. For installations falling under the scope of the IED, if a necessary BAT-Associated Emission Level (BAT-AEL) is not in the permit it must be checked if there is an explanation as prescribed by the Article 15.4 in the IED.

In the BREF (2015), BAT-AEL are established only for ammonia emissions from an animal house for pigs, for an animal house for laying hens, broiler breeders or pullets and for an animal house for broilers. If there is no (good) explanation, feedback to the permit writer and the operator must be given. If a BAT prescribed in the permit is present, works properly but the ELV is not met, possible alternatives can be discussed with the permit writer and the operator.

2.3 MAIN QUESTIONS FOR INSPECTION

The major points of interest for inspection for the activities related to pig and poultry farms are the following:

2.3.1 Nutritional management

In order to reduce the total nitrogen (and consequently ammonia emissions) and phosphorus excreted while meeting the nutritional needs of the animals, check compliance with the BATs set in the permit, regarding the use of a diet formulation and nutritional strategy.

Commonly adopted techniques include multiphase feeding with a diet formulation adapted to the specific requirements of the production period, and the reduction of the crude protein content by using a balanced diet based on net energy for pigs (or metabolisable energy for poultry) and digestible amino acids.

2.3.2 Housing

Emissions to air

Check compliance with the BATs set in the permit for:

- ammonia (NH₃), methane (CH₄) and nitrous oxide (N₂O) emissions,
- odour emissions,
- dust emissions,
- noise emissions.

Air abatement techniques for ammonia, odour and dust emissions from animal housing. Check compliance with BATs and conditions set in the permit. Check parameters such as hours of functioning in pumps, electricity consumption, waste water production and acidity in air scrubbers (end of pipe techniques to control emissions)

Emissions to water

Check compliance with the BATs set in the permit for:

- cleaning waste water collection and treatment.

2.3.3 Manure storage

Emissions to air

In order to reduce ammonia emissions to air from solid manure storage and from a slurry tank/earth-banked storage (lagoon) of slurry, check compliance with BATs set in the permit.

One of the techniques most commonly applied is to reduce the ratio between the emitting surface area and the volume of the heap, and to cover the heaps, in the case of solid manure; to cover slurry tanks with rigid covers, flexible covers or floating covers and the appropriate design and management of slurry tanks; minimise stirring of slurry in the case of earth-banked storage (lagoon) of slurry.

Emissions to soil, water and groundwater

In order to prevent, or where that is not practicable, to reduce emissions to soil and water from solid manure storage, and to prevent them from slurry collection, piping and from a tank/or an earth-banked storage (lagoon), check compliance with BATs set in the permit.

One of the techniques most commonly applied is to select a storage facility with a sufficient capacity to hold the manure for the prescribed time (more than 3 months in Spain) on solid impermeable floor equipped with a drainage system and a collection tank for the run-off or alternatively use a concrete silo for storage, in the case of solid manure; to construct leak-proof facilities and equipment for collection and transfer of slurry (e.g. pits, channels, drains, pump stations) or to store slurry in earth-banked stores (lagoons) with an impermeable base and walls e.g. with clay or plastic lining (or double-lined).

Check signs of spills releases from pits, tanks, lagoons, pipes, hoses and pumps. Take samples from piezometers, boreholes and wells if necessary.

2.3.4 On-farm manure processing

Emissions to air and water

In order to reduce emissions of nitrogen, phosphorus, odour and microbial pathogens to air and water and facilitate manure storage and/or landspreading, check compliance with BATs set in the permit.

Mechanical separation, anaerobic digestion in a biogas installation and aerobic digestion are techniques applied.

Check proper operation of installations and processes.

2.3.5 On-farm manure application

Emissions to air

In order to reduce ammonia emissions to air from the application of slurry check compliance with BATs and conditions set in the permit.

Techniques applied include the use of band spreaders with a trailing hose or a trailing shoe, or shallow or deep injectors, combined with the incorporation of the manure into the soil as soon as possible (0-4 hours delay, up to 12 hours when conditions are not favourable for a faster incorporation).

Emissions to soil, water and groundwater

In order to prevent or, where that is not practicable, to reduce emissions of nitrogen, phosphorus and microbial pathogens to soil and water, check compliance with BATs and conditions set in the permit.

Techniques applied include to assess the manure receiving land to identify risk of run-off, to leave untreated strips of land keeping sufficient distances with areas where there is a risk of run-off (watercourses, springs, boreholes) and neighbouring properties, to avoid manure spreading when the risk of run-off can be significant (floods, snow, freeze). Most relevant is to adapt the manure application rate taking into account the nitrogen and phosphorus content of the manure and taking into account the characteristics of the soil, the seasonal crop requirements and weather or field conditions that could cause run-off.

Check the register of plots of land in which manure is spread, including, amounts of manure spread, estimated nitrogen and phosphorous content, crop of the plot, characteristics of the soil and timing of the application on a yearly/seasonal basis.

2.3.6 Waste water treatment

For discharge into running waters or a public sewage system, waste waters must comply with emission limits. Check compliance with the BATs set in the permit.

In poultry farms waste water should be stored in special tanks and dealt with separately. In pig farms, waste water is commonly added to the slurry and treated in combination or applied directly to land.

Pay attention on waste water from:

- cleaning livestock houses and equipment,
- facilities for personnel and
- run-off from yards and open concrete areas that are contaminated by manure, waste animal feed, etc.

2.3.7 Storage of dead animals

Management of dead animals shall be carried out properly, in authorised dedicated plants, in order to prevent the possible spread of pathogens. Check compliance with the BATs set in the permit.

Check following parameters:

- disposal of Category 2 material (eg. incineration or co-incineration, landfilled, use for manufacturing of organic fertilisers or soil improvers, composting or transforming into biogas, use as a fuel for combustion, use for the manufacture of derived products),
- management of animal by-products in remote areas; when animal population is so small, and where disposal establishments or plants are so far away that the arrangements necessary for the collection and transport of animal by-products would be unacceptably onerous compared to local disposal,

- management of animal by-products in disease control situations; burial and burning of animal by-products of the animals killed as a measure to control an outbreak of a serious transmissible disease.

2.3.8 Storage of hazardous and non-hazardous waste

Storage of hazardous and non-hazardous waste should be carried out in conditions providing protection for the environment and human health. Hazardous waste displays one or more of the hazardous properties listed in Annex III of the Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste. Check compliance with the permit.

Pay attention to following parameters:

- that storage of waste does not have any harmful effects on the environment and human health,
- that the actual period of the storage of waste does not exceed the allowed one,
- that hazardous waste is not mixed, either with other categories of hazardous waste or with other waste, substances or materials,
- that hazardous waste is packaged and labelled in accordance with the international and Community standards in force,
- that the treatment with the waste after storage is in accordance with the permit or other Regulations.

Table 9.2: Hazardous waste types generated in pig and poultry farms.

Waste code	Description
18 02	wastes from research, diagnosis, treatment or prevention of disease involving animals
18 02 02*	wastes whose collection and disposal is subject to special requirements in order to prevent infection
18 02 07*	cytotoxic and cytostatic medicines

2.3.9 Monitoring

The BAT on monitoring include the following:

Total nitrogen and phosphorus excreted in manure

Check that the total nitrogen and phosphorus excreted in manure is monitored at least once a year for each animal category. The techniques applied (it is enough to use one of them) include the following:

- b. A mass balance of nitrogen and phosphorus based on the feed intake, dietary content of crude protein, total phosphorous and animal performance.
- c. Estimation by using manure analysis for total nitrogen and total phosphorus content

Emissions to air

Check that the ammonia emissions to air are monitored. The techniques applied (it is enough to use one of them) and frequencies of monitoring include the following:

- estimation, at least once a year for each animal category, by using a mass balance based on the excretion and the total (or total ammoniacal) nitrogen present at each manure management stage.
- calculation by measuring the ammonia concentration and ventilation rate using ISO, national or international standard methods or other methods ensuring data of an equivalent scientific quality. The frequency shall be, every time there are significant changes to at least one of the following parameters: a) the type of livestock reared at the farm; b) the housing system
- estimation, at least once a year for each animal category by using emission factors

Check that odour emissions to air are monitored periodically, using EN standards, or alternative methods for which no EN standards are available, ISO, national or international standard methods or other methods ensuring data of an equivalent scientific quality.

Check that dust emissions to air from an animal house are monitored with a frequency of at least once a year using one the following techniques:

- calculation by measuring the dust concentration and ventilation rate using EN standard methods or other methods (ISO, national or international) ensuring data of an equivalent scientific quality,
- estimation using emission factors,
- check that ammonia, dust and/or odour emissions from an animal house equipped with an air cleaning system are monitored using all of the following techniques,
- verification, at least once a year, of the air cleaning system performance by measuring ammonia, odour and/or dust under practical farm conditions and according to a prescribed measurement protocol and using EN standard methods or other methods (ISO, national or international) ensuring data of an equivalent scientific quality,
- control, at least daily, of the effective function of the air cleaning system (e.g. by recording continuously operational parameters or using alarm systems).

Process parameters

Check that the following process parameters are monitored at least once a year:

- water consumption,
- electric energy consumption,
- fuel consumption,
- number of incoming and outgoing animals, including births and deaths when relevant,
- feed consumption,
- manure generation.

Emissions to surface water

When a waste water discharge permit is in place, check that waste water parameters are monitored with the frequency laid down in the permit.

Emissions to soil and groundwater

Check that soil and groundwater are monitored with the frequency laid down in the permit.

Table 9.3: Template for checklist – On-site Inspection.

NUTRITIONAL MANAGEMENT				
STORAGE OF DEAD ANIMALS				
STORAGE OF HAZARDOUS AND NON-HAZARDOUS WASTE				
OTHER				
EMISSIONS	HOUSING	MANURE STORAGE	ON-FARM MANURE PROCESSING	ON-FARM MANURE APPLICATION
Emissions to air				
Emissions to surface water				
Emissions to soil, and groundwater				
OTHER				

3 AFTER THE INSPECTION

3.1 INSPECTION REPORTING

After the inspection, according to EU best practices, the inspector has to draft a final inspection report. A template for such report must be in place in each inspection authority. The main contents of such a report are the following:

Baseline of the inspection

- inspection basis (permit, legal regulations),
- competent inspection authority, cooperating inspection authorities,

- kind of installation (e. g. slaughterhouse, meat processing),
- operator (name of the company),
- address,
- date of inspection,
- length of inspection time,
- scope of the inspection (e. g. integrated inspection, media that were inspected, parts of the installation that were inspected),
- kind of inspection (regular, extraordinary, control).

Inspection's results

- no or only minor non-compliances,
- significant or relevant non-compliances,
- serious or important non-compliances.

Recommended corrective measures

- minor corrective measures,
- significant or major corrective measures,
- serious or important corrective measures.

9.3.2 INSPECTION RECORDING

The inspection report and any other additional material used for the preparation of the inspection should be stored and made accessible to any relevant authorities for their information.

4 FOLLOW-UP MEASURES

After the inspection, depending on the degree of non-compliance and the kind of corrective measures recommended different actions may be necessary:

- issuing a letter to the company ;
- informing other inspecting bodies;
- planning a follow-up inspection;
- fixing of fines;
- subsequent order;
- criminal or non-criminal follow-up.

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**Nature protection in permitting and inspection of industrial installations –
Implementation of Art. 6(3) of the Habitats Directive (phase 3) –
Part 1: Updated wind energy development case studies**

Draft final report: 20 / 03 / 2017
Report number: 2015 / 14



European Union Network for
the Implementation and Enforcement
of Environmental Law

Introduction to IMPEL

The European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL) is an international non-profit association of the environmental authorities of the EU Member States, acceding and candidate countries of the European Union and EEA countries. The association is registered in Belgium and its legal seat is in Bruxelles, Belgium.

IMPEL was set up in 1992 as an informal Network of European regulators and authorities concerned with the implementation and enforcement of environmental law. The Network's objective is to create the necessary impetus in the European Community to make progress on ensuring a more effective application of environmental legislation. The core of the IMPEL activities concerns awareness raising, capacity building and exchange of information and experiences on implementation, enforcement and international enforcement collaboration as well as promoting and supporting the practicability and enforceability of European environmental legislation.

During the previous years IMPEL has developed into a considerable, widely known organisation, being mentioned in a number of EU legislative and policy documents, e.g. the 6th and 7th Environment Action Programme and the Recommendation on Minimum Criteria for Environmental Inspections.

The expertise and experience of the participants within IMPEL make the network uniquely qualified to work on both technical and regulatory aspects of EU environmental legislation.

Information on the IMPEL Network is also available through its website at:

www.impel.eu .

<p>Title report: Nature protection in permitting and inspection of industrial installations – Implementation of Art. 6(3) of the Habitats Directive (phase 2) – Part 1: Important aspects regarding wind energy developments</p>	<p>Number report: [2015 / 14]</p>
<p>Project manager: Gisela Holzgraefe (DE)</p>	<p>Report adopted at IMPEL General Assembly: [.....]</p>
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<p>Project team Gisela Holzgraefe (DE), Iñaki Bergareche Urdampilleta (ES), Andreja Slapnik (SI), Ana Garcia (PT), Martin Baranyai (CZ)</p>	

Executive summary:

This document (Part 1: Updates to wind energy development case studies) forms one of two documents on wind energy developments comprising the results of the IMPEL project “**Nature protection in permitting and inspection of industrial installations – Implementation of Art. 6(3) of the Habitats Directive**” (phase 3). This project was part of a combined approach, which also considered the development of a sector specific guidance for farm projects (pigs and poultry) with respect to implementation of article 6(3) of the Habitats Directive.

Reconciling renewables and biodiversity is a big issue for many countries, and so the project team have developed two documents concerning wind energy developments and Natura 2000. (1) compiling supporting case studies which may be used by regulators and the industry alike to inform and support future wind energy proposals (hereafter termed as ‘Part 1’), and (2) some important aspects of the developments in the wind energy sector related to the work of the authorities in the IMPEL member states concerning the enforcement of Art. 6(3) Habitats Directive (hereafter termed as ‘Part 2’). Both documents are also based on information provided by the EU guidance document on “Wind energy developments and Natura 2000”. Part 2 is intended to inform any future updates the Commission seek to make to the existing EU guidance and is directly submitted to the Commission.

The work was carried out in two project team meetings and a workshop. During the workshop experts were invited to provide detailed information about new developments, namely from the Portuguese national authority on nature conservation (ICNF) about the appropriate assessment and mitigation of impacts of wind farms on flying vertebrates and from Wageningen UR, the University & Research centre from the Netherlands, that presented a supporting tool for the screening phase (the Dutch effectenindicator).

Disclaimer:

This report is the result of a project within the IMPEL network. The content does not necessarily represent the view of the national administrations or the European Commission.

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I. Introduction

Background to the project

In 2014 IMPEL carried out a project on “Nature protection in permitting and inspection of industrial installations – implementation of Art. 6(3) Habitats Directive”. In the subsequent workshop, guidance documents were discussed, both general and specific to sectors. On the European level the general overarching Habitats Directive guidance includes:

- a) Managing Natura 2000 sites: the provision of Article 6 of the Habitats Directive 92/43/EEC.
- b) Assessment of plans and projects significantly affecting Natura 2000 sites: methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.
- c) Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC: clarification of the concepts of alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence. Opinion of the Commission.

Sector specific guidance documents include the European Commission Guidance ‘Wind energy developments and Natura 2000’(hereafter termed ‘Guidance’).

This IMPEL project was aimed at exploring best practice examples of wind farm projects and highlighting updates to be included in any future revision of the guidance. The project team have developed two documents (‘Part 1’ and ‘Part 2’) compiling important developments in the wind energy sector, and taking into account information provided by the existing Guidance. The Guidance is a valuable document that provides information both on the sector and overarching themes, complementing existing knowledge on the possible impacts and procedures for implementing the Habitats and the Birds Directive.

Part 1 (this document) seeks to analyse data and information collected with reference to the Art. 6(3) procedure of the Habitats Directive, and provide examples of guidance, concrete criteria and assessment approaches applied in Member States wherever possible, that could be useful from the perspective of regulators as well as nature conservation and land use planning authorities.

The development of wind farm projects has been especially dynamic through recent years, with increased understanding of their impacts on nature and biodiversity. This is also reflected in scientific studies, literature reviews and new guidance, although it can be difficult to find documents that reflect this growing body of knowledge in the field of wind energy. Competent authorities have indicated that it would be very helpful to have a document collating different approaches based on state-of-the-art methods and techniques developed since the Guidance was last published - particularly in the context of the Art. 6(3) procedure. To this end, Part 1 of this project is therefore designed to provide supportive real-life case studies to support this need.

Part 2 seeks to highlight potential updates which could be made to the guidance in line with technical advancements within the sector since its publication in 2010. Part 2 is submitted to the European Commission on the understanding that it will support any future updates that the Commission seek to make to the existing guidance.

Parts 1 and 2 of this project have been developed in an attempt to address both of these needs, pending any future update of the Guidance by the European Commission.

Introduction to Part 1

Part 1 seeks to provide regulators and operators alike, with updated case studies which can be used to support future applications, their regulation and proposals for mitigation. The information contained within Part 1 will be published on the IMPEL website for public access.

II. Strategic planning considerations – management plans

Management Plans, where established, are a useful tool for ensuring the implementation of Article 6.1 of the Habitats Directive. They can provide useful information for impact assessment and can be used to enforce relevant measures, primarily preventive, to avoid deterioration. They must be taken into account by spatial as well as sectorial plans.

In the case of Galicia (Spain) the Management Plan for the Natura 2000 Network (March 2014) excludes new wind energy developments on Natura 2000 sites, except repowering projects which shall be subject to appropriate assessment.

The following example from Germany provides general information and defined criteria for strategic planning of wind energy development

- Recommendations for the spacing of wind farms to important bird habitats as well as breeding grounds for selected bird species'. (LAG VSW) (2015), Lower Saxony.
- Guidance on the consideration of nature conservation and landscape management for site planning and approval of wind energy installations. Nature conservation and wind energy. (Lower Saxony) (October 2014) (Niedersachsen (German federal state)).

Recommendations for species-specific contributions in the context of the construction of wind turbines in wind farms with corresponding species-protection rights reservations. (Ministry for Energy, Agriculture, Environment and Rural Areas of the State of Schleswig-Holstein (MELUR) / Landesamt für Landwirtschaft, Umwelt und ländliche Räume der Landes Schleswig-Holstein (LLUR), July 2013) provides details regarding the erection of wind energy installations within the limits of the so-called potential impairment areas for some sensitive species of large birds.

In Germany several Länder (federal states) have developed procedures for a systematic development of wind farm projects on their territory in order to have a planned and transparent approach. The purpose of it is to avoid conflicts with the residents and the objectives of nature conservation on the one hand and the objectives of the development of renewables and the interested investors on the other hand. On Länder level their competent regional (and land use) planning organisations systematically identified the suitable sites for wind farm projects (appropriate wind areas, the so called Windeignungsgebiete) based on defined criteria.

In Schleswig-Holstein wind areas are currently being further developed into priority areas (the so called Vorranggebiete). This is a consequence of a court decision. The list of criteria in Schleswig-Holstein contains strict taboo criteria as well as soft criteria plus additional criteria for the weighing process for the sites remaining after deduction of strict taboo and soft criteria (**see Annex 1 of this document**). The procedures include the phases of planning, of public participation (so that the background documents are accessible for everybody) and of decision making on the priority areas (including documentation of reasons). After the determination of suitable sites new wind farm projects generally can only be planned inside the designated areas. In the frame of carrying out repowering projects old wind turbines outside the designated areas have to be removed.

III. Minimising impacts on nature and wildlife

Concerning the minimisation of impacts, the Guidance refers to the concept of ‘well designed wind energy developments’ (box text, page 29), being important for future work to explore criteria for and examples of the appropriate siting of the wind farms or aspects related to the design of wind turbines.

Addressing the minimisation of impacts on bats it is of great importance to consider barotrauma. The EUROBATS guidelines [1] and publications such as Mascarenhas *et al.*, (2015) [2] are examples of the most recent documents on impacts to bats from wind farm projects:

[1] Rodrigues, L. et al. (2015) Guidelines for consideration of bats in wind farm projects – Revision 2014. EUROBATS Publication Series No. 6 (English version). UNEP/EUROBATS Secretariat, Bonn, Germany, 133 pp.
http://www.eurobats.org/sites/default/files/documents/publications/publication_series/pubseries_no6_english.pdf

[2] Mascarenhas, M. et al. (2015) Biodiversity & Wind Energy: a bird’s and bat’s perspective. Bio3 and University of Aveiro, Aveiro, Portugal
<http://pt.calameo.com/read/00416784792fdd8229d83>

Further studies have been conducted in Flanders concerning collision and avoidance of birds:

- [3] Joris Everaert (2014) Collision risk and micro-avoidance rates of birds with wind turbines in Flanders, *Bird Study*, 61:2, 220-230, DOI: 10.1080/00063657.2014.894492
- [4] Everaert, J., Peymen J., van Straaten D. (2011). Risico's voor vogels en vleermuizen bij geplande windturbines in Vlaanderen. Dynamisch beslissingsondersteunend instrument.
- [5] Effecten van windturbines op fauna in Vlaanderen, Rapporten van het Instituut voor Natuur- en Bosonderzoek, INBO.R.2011.32. Instituut voor Natuur- en Bosonderzoek (INBO): Brussel. 110 pp.

There is also a useful document developed by the RSPB addressing off-shore and micro-turbines:

- [6] Royal Society for the Protection of Birds (RSPB) & Birdlife International (2013): Wind Farms and Birds: An updated analysis of the effects of wind farms on birds, and best practice guidance on integrated planning and impact assessment. Bern Convention Bureau Meeting 17 September 2013.

IV. Assessing effects on Natura 2000 sites

This procedure is explained in full detail in chapter 5 of the Guidance, which provides the definition of the framework procedures for the implementation of the Article 6(3) of the Habitat Directive.

Stage 1: Screening

The project participants found out that new tools, methodologies, software, forms or documents are applied across various Member States at the screening stage to help screen out unnecessary assessments. New methodologies and software include information concerning the plan/project and the Natura 2000 site, its habitats and species (magnitude of impact; type; extent; duration; intensity; timing; probability; cumulative effects) and evaluation of the significance of impacts; and its connection with.

a) Examples of screening tools

The Dutch Effectenindicator Natura 2000

An example of a useful screening tool is the Dutch Effectenindicator Natura 2000. It provides information about the effects produced by wind power developments on Natura 2000 sites.



Home > [Natura 2000](#)

- > Procedure
- > Natura 2000-gebieden
- > Habitattypen
- > **Effectenindicator**
- > Routeplanner beschermde natuur

Effectenindicator

Selecteer eerst hieronder het gebied waarin of in de buurt waarvan de activiteit plaatsvindt. Selecteer daarna de activiteit en kies dan 'Toon effecten', er verschijnt dan een soorten/habitattypen - storingsfactoren tabel wat is de gevoeligheid van een soort/habitatype voor verschillende storingsfactoren.

U kunt ook een overzicht samenstellen door zelf de soorten en/of habitattypen en storingsfactoren te kiezen:

Site's name

> Soorten-, habitattypen- en storingsfactorenkeuze

Gebieds- en activiteitenkeuze

Selecteer een Natura 2000-gebied

Selecteer een activiteit

Toon effecten

Activity: windturbines



Home > [Natura 2000](#)

- > Procedure
- > Natura 2000-gebieden
- > Habitattypen
- > **Effectenindicator**
- > Routeplanner beschermde natuur

Effectenindicator

Overzicht effecten op soorten en/of habitattypen.
De selectie is uitgevoerd op gebied 'Brabantse Wal' en activiteit 'Windturbines'.

> [Terug naar zoekopdracht](#)

Storingsfactor	1	2	13	15	16	17	18
Stuifzandheiden met struikhei	■	■	■	■	■	■	■
Zandverstuivingen	■	■	■	■	■	■	■
Zwakgebufferde vennen	■	■	■	■	■	■	■
Zure vennen	■	■	■	■	■	■	■
Vochtige heiden	■	■	■	■	■	■	■
Droge heiden	■	■	■	■	■	■	■
Drijvende waterweegbree	■	■	■	■	■	■	■
Kamsalamander	■	■	■	■	■	■	■
Boomleeuwerik (broedvogel)	■	■	■	■	■	■	■
Dodaars (niet-broedvogel)	■	■	■	■	■	■	■
Dodaars (broedvogel)	■	■	■	■	■	■	■
Geoorde fuut (broedvogel)	■	■	■	■	■	■	■
Geoorde fuut (niet-broedvogel)	■	■	■	■	■	■	■
Nachtzwaluw (broedvogel)	■	■	■	■	■	■	■
Wespendief (broedvogel)	■	■	■	■	■	■	■
Zwarte Specht (broedvogel)	■	■	■	■	■	■	■

Verandering in populatiedynamiek
Verstoring door mechanische effecten
Opmerkelijke verstoring
Verstoring door trilling
Verstoring door geluid
Versnippering
Oppervlakteverlies

The process below outlines the two steps involved in undertaking a screening assessment using the Effectindicator.

Step 1

The name of the Natura 2000 sites and the activity are the input given by the user and as a result a table is shown with all the items (habitat types and species) in rows and impacts in columns. For each item, the sensitivity level (very sensitive in red colour; sensitive in amber; non sensitive in red; unknown; doesn't apply) is represented in the cells of the table.

Step 2

The user has to assess whether the individual item (species or LRT of the site) is really affected, e.g. by noise emission. If the emissions will not change or the LRT will not be reached the red/amber fields may be ruled out so that the screening may end here.

The German FFH-VP screening IT tool

As part of the "Appropriate Assessment Information System" (called FFH-VP-Info) this IT tool is, in particular, a support for proponents, planning agencies, nature conservation and competent authorities and the general public involved in appropriate assessments.

A list of potential impacts on habitat types and habitats of species included in Natura 2000 sites is proposed. Those which could be a consequence of wind turbines (onshore) are highlighted in amber¹. The relevance of each is given in form of an indicator (0 generally not relevant, 1 potentially relevant, 2 regularly relevant):

Table 1: List of potential impacts on habitat types and habitats of species included in Natura 2000 sites.

Impact group	Impact factor	Relevance
1 Direct land take	1-1 Habitat loss	2
2 Change of structure/ use	2-1 Direct changes of vegetation- and biotope structures	2
	2-2 Loss /Change of characteristic dynamics	0
	2-3 Intensification of agriculture, silviculture and aquaculture uses	0
	2-4 Short time abandonment of habitat characteristic use/tending	0
	2-5 Long time abandonment of habitat characteristic use/tending	0

¹ <http://ffh-vp-info.de/FFHVP/Projekt.jsp?m=1,0,8,2>

3 Change of abiotic site conditions	3-1 Alteration of soil or subsoil	0
	3-2 Alteration of morphologic conditions	0
	3-3 Alteration of hydrologic/hydrodynamic conditions	0
	3-4 Alteration of hydro chemical conditions	0
	3-5 Alteration of temperature conditions	0
	3-6 Change of other site conditions, specially factors relevant for climatic conditions	0
4 Barrier and trap effect	4-1 Construction-related barrier or trap effect/loss of specimen	1
	4-2 Project/Installation-related barrier or trap effect/loss of specimen	2
	4-3 Operation-related barrier or trap effect/loss of specimen	2
5 Impacts not related to substances	5-1 Noise	2
	5-2 Optical effects	2
	5-3 Light	1
	5-4 Vibration	1
	5-5 Impact by mechanical effects	2
6 Impacts related to substances	6-1 Nitrogen and phosphate compounds related nutrient input	0
	6-2 Organic compounds	0
	6-3 Heavy metals	0
	6-4 Other pollutant substances arising from combustion or production processes	0
	6-5 Salt	0
	6-6 Depositions with structural impact (dust/suspended matter and sediments)	1
	6-7 Odour	0
	6-8 Medicament residues and endocrine active substances	0
	6-9 Other substances	0
7 Radiation	7-1 Non ionizing radiation/Electromagnetic fields	0
	7-2 Ionizing radiation/radioactive radiation	0

8 Targeted manipulation of species and organisms	8-1 Management of autochthonous species	0
	8-2 Supply and spread of alien species	0
	8-3 Control of organisms (pesticides)	0
	8-4 Release of genetically new or modified organisms	0
9 Other	9-1 Other	0

The user has to assess whether the individual item (species or LRT of the site) is really affected, e.g. by noise emission. If the emissions will not change or the LRT will not be reached the relevant fields may be ruled out so that the screening may end here.

b) Other aspects

It is also important to provide examples of how the provisions of the Art. 5 of the Birds Directive and Art. 12 and 13 of Habitats Directive have been implemented in Member States. Some Member States have established provisions for the appropriate assessment in their national legislation (such as the Netherlands) based on the implementation of the strict protection of species as provided in Art. 5 of Birds Directive and Art. 12 and 13 of Habitat Directive.

Permit writers - if screening is their task - need clear information on:

- Gathering sufficient and appropriate information for the screening and appropriate assessment of wind energy projects;
- Concerning cumulative effects. For instance, for marine areas, 3 methods for the assessment of cumulative effects, including offshore wind farms, have been developed (CUMULEO project developed by IMARES, the HARMONY project and ODEMM).
- Screening procedures and decisions, significance criteria and thresholds. For each type of potential impact factor / type of disturbance a clear statement concerning the significance should be in place.
- Existing and acknowledged proposals of criteria or tables regarding minimum distances to sensible areas for birds (breeding, roosting and feeding areas). See the examples from Germany mentioned in **Annex 1**.

Stage 2: Appropriate assessment and mitigation measures

The project group identified current information on new technologies for mitigation of negative effects of significant impacts Wind farms caused on flying vertebrates, particularly on bats and birds. For birds, radar systems can reduce, for onshore as well as offshore

locations, as well as cut out entirely, the movement of blades during migratory events. For bats, results of the changing cut-in speed experiment show that reducing turbine operation during periods of low wind speeds may significantly reduce bat mortality with marginal annual power losses. Such measures may minimise the impact of operating turbines, reducing the risk of fatalities due to collision and or barotrauma (the example of Portugal at **Annex 2** provides a basis for further development in this area).

Annex 1

List of examples of strict taboo criteria and soft criteria used in Land Schleswig-Holstein: (due to a court decision currently under discussion)

1. Strict taboo criteria

- inner areas with development plans and unplanned inner areas covered by the provisions of the German Federal Building Code,
- areas with detached houses and splitter settlements
- buffer zone of 250 m around the areas of the first two indents
- protected zones along roads (motorways 40 m, national and federal highways 20 m, district roads 15 m, municipal roads 10 m),
- protected zones along waterways
- military properties
- protected zones along water bodies
- water protection areas / water conservation areas (zone I and II)
- protected sites (acc. § 23 section 3 BNatschG)
- areas for which procedures for determining them as nature conservation site have started
- national park Waddensea Schleswig-Holstein
- legally protected biotopes
- forests and a buffer zone of 30 m

2. Soft criteria for areas where wind turbines may be generally allowed but for reasons of equal treatment they should be excluded

- buffer zone of 150 m round detached houses and splitter settlements in the outskirts and round industrial estates/business parks additional to the zone defined as strict taboo criterion
- buffer zone of 550 m round settlement areas with residential and recreational function additional to the zone of 250 m defined as strict taboo criterion.
- round planned residential areas a zone of 800 m and a zone of 400 m round industrial estates/business parks
- settlement axes and settlement areas determined in regional plans
- regional green corridors of planned areas
- protected zones along roads (motorways 40 - 100 m, national and federal highways 20 – 40 m, district roads 15 – 30 m, municipal roads 10 – 30 m),
- protected zone of 150 m along railway tracks
- sovereign radio relay routes for civil use
- protected zone of 5 km round the weather radar station in Boostedt and sections in a protected zone of 15 km, within which no wind turbines have been built so far
- protected zones around radar systems for the civil air traffic control (core zone of 600 m taboo zone)
- areas with general construction ban for wind turbines in military areas
- buffer of 100 m to high-voltage and extra-high-voltage lines
- zone of 100 m to dikes and installations / systems for coastal

protection

- priority areas for sustainable raw material supply /extraction of raw materials (excluding those with finalized extraction)
- lines of sight of the UNESCO world heritage site of the historic city center of Lübeck
- 5 km distance to the Danewerk / Haithabu (potential UNESCO world heritage site)
- North Frisian islands and Hallig islands outside the national park Waddensea
- zone from coastal line till geographical territorial boundary in North Sea and Baltic Sea (excepted: area for the offshore windpark with up to 55 turbines)
- landscape conservation areas (except those for which wind turbines are explicitly allowed)
- areas designated to become landscape conservation areas
- core areas of the biotope network system
- EU bird sanctuaries
- buffer of 300 m round sanctuaries
- breeding grounds of sea eagles (area with high population)
- important feeding grounds for geese (except graylag geese and Neozoen) and swans (Whooper Swan and Bewick's Swan) outside of EU sanctuaries as well as a zone of 1 000 m round colonies of black terns (*Chlidonias niger*) and Gull-billed Terns
- breeding grounds of grassland/meadow birds
- important corridors for the flight of birds between roosting grounds and feeding grounds of geese and swans
- zone of 3 km to sleeping waters of cranes
- coastal zones at the North Sea and on the island of Fehmarn which are important feeding grounds and resting areas outside of EU sanctuaries and the island of Helgoland
- winter refuges for bats (mass refuges > 1 000 individuals) plus buffer zone of 3 km
- protected sites acc. to the Habitats Directive
- areas fulfilling the criteria for becoming protected sites
- zone of 300 m round protected nature conservation areas
- zone of 300 m round the national park
- zone of 300 m round protected sites acc. to the Habitats Directive
- buffer zone of 30 – 100 m round forests
- water areas / water surfaces
- small secluded sites, on which it is not possible to establish at least three wind turbines

3. Additional criteria for the weighing process within the potential sites that remain after application of strict and soft taboo criteria. They are at the same time criteria to be weighed for exemptions acc. § 18a sec. 2 Land Use Planning Act.

If no taboo criteria acc. to no 1 or 2 apply, the state planning authority includes the following aspects and spatial and legal conditions/facts into the assessment of the priority areas:

- planned developments of settlements of communities and cities
- city and surrounding areas in rural areas as well as areas of concentrated construction near Hamburg, Lübeck and Kiel

- priority areas for tourism and recreation und future priority areas for tourism and recreation
- effect of encirclement; barrier effect
- zone of 600 m to 15 km around radar systems for the civil air traffic control
- aerodrome, approach and departure areas of airports
- zone of constructional restrictions of airports
- areas with restrictions from military uses including military radio relay routes
- sectors within the 15 km zone but outside the 5 km core zone round the DWD weather radar system Boostedt in which wind turbines have already been built
- areas for which permits for sustainable raw material supply /extraction of raw materials have already been issued
- zone of 800 m round legally protected cultural monuments (in principle only regionally significant monuments, e.g. churches with spires)
- zones of 2 km round legally protected cultural monuments which can be seen over a long distance or are situated on an impressive height or an significant single location
- zone of 5 km round city silhouettes or views of places significant for the historical landscape
- grid capacity
- priority areas for inland flood protection
- nature parks
- characteristic landscapes
- crossing aids and corridors linked to them
- designated compensatory areas for road construction projects
- geotopes worth protecting (geological-geomorphologically special forms, e.g. moraine hills, systems of tunnel valleys, steep embankments)
- priority areas and important connecting axes between protected sites and the biotope network
- spatial concentration of small and smallest biotopes
- zone of 300 to 1 200 m round bird sanctuaries
- important corridors of bird flights/migration
- potential areas of disturbance in zones of 3 000 m radius round eyries of grey sea eagles outside the areas of high population, zones of 1 000 m radius round eyries of black storks and zones of 1 500 mm round nests of red kites
- assessment areas within a 3 to 6 km radius round eyries of grey sea eagles, within a 1 to 2 km radius round eyries of white storks and 1,5 to 4 km radius round with certainty proven locations of nests of red kites
- locations of nests of red kites that have not been proven with certainty and their surroundings (potential areas of disturbance and assessment areas)
- areas of particular importance for bat protection
- further criteria related to the individual case, i.a. for the protection of species, concerning the development of settlements, the historical cultural landscape and the landscape.

Annex 2:



Appropriate assessment and mitigation of impacts of wind farms on flying vertebrates

Abstract¹

Wind farms can cause significant impacts on flying vertebrates, particularly on bats and birds, due to (1) direct and indirect mortality (caused by collision and barotrauma), (2) loss, deterioration and fragmentation of habitats (that also affect plant communities, large mammals and the ecosystems in general) and (3) disturbance and displacement/exclusion (barrier effects). This is particularly worrisome as some of the potentially affected bat and bird species are threatened.

Bearing in mind the general challenges of ensuring the appropriate assessment of all wind farm projects as demanded by Article 6 (3) of the Habitats Directive, this presentation approaches this subject by presenting some specific guidance and knowledge regarding the effects of wind farms on bats in continental Portugal. Portuguese recommendations regarding roost inventory/monitoring, habitat survey and mortality assessment are presented as well as some results of the “Report on the effect of wind farms on bats in continental Portugal (2010)”. Particularly interesting are those that show a coincidence between higher mortality and higher bats’ activity per month and also a significant negative relation between bats’ activity and wind speed. Following the results of an experiment that shows significant decreases in bats’ mortality associated with a change in the cut-in speed of wind turbines (a change from 3 to 3,3 m/s in 6 turbines implied 31,4% less fatalities, and in 15 turbines 78,5%).

Thus, data collected in Portuguese wind farms and the results of the changing cut-in speed experiment show that reducing turbine operation during periods of low wind speeds (between 3 and 5 m/s) may significantly reduce bat mortality with marginal annual power losses. This accumulated knowledge is already being used in two Portuguese wind farms located near roosts of national importance, where developers are obliged to establish turbine cut-in speed at 5 m/s all night during Autumn (October-December) and Spring (March-April) in one case and at 3,3 m/s all night all year round in the other case.

Furthermore, an innovative mitigation measure for migratory soaring birds based on radar assisted shutdown on demand that has induced zero mortality so far is also presented. This example is from a wind farm located, near Sagres, Southwest Portugal, in a migratory flyway for c.a. 4000-5000 individuals/year of 36 species of soaring birds.

In order to prevent mortality by collision, a turbine temporary shutdown on demand during Autumn migration (15 August – 30 November), assisted by a real-time surveillance programme that combines radar and visual surveillance, has been considered mandatory by the Portuguese authorities. Though collision risk is high involving a lot of birds each year (particularly for griffon vulture which is the most numerous migratory raptor in Sagres and a

poor flyer), the adoption of the radar assisted shutdown on demand mitigation measure has resulted in zero mortality of soaring birds crossing over this wind farm (2010-2014).

The success of this measure benefits from the experience accumulated by the monitoring team. Since 2013 the team has direct access to the wind farm SCADA system, which has contributed to reduce drastically the shutdown events and hours (in 2014, 30 shutdowns implied less than 20 hours in a period of 108 days of monitoring). These results combined with the fact that almost half of the shutdown equivalent time has occurred with wind speed below 5 m/s (low productivity periods) allows the conclusion that, in this case, losses in energy production are negligible when compared to nature conservation gains.

Appropriate assessment and mitigation of impacts of wind farms on flying vertebrates

Maria Inês Trigo, Luísa Rodrigues & Ricardo Tomé ^{STRIX}

IMPEL Project "Nature protection in permitting and inspection of industrial installations – Implementation of Art. 6(3) of the Habitats Directive", Workshop, Berlin, 24th August 2015

Appropriate assessment and mitigation of impacts of wind farms on flying vertebrates

Brief introduction

Bats

- Portuguese recommendations
- Report on the effect of wind farms on bats in continental Portugal (2010)
- Bats activity and wind speed
- Experiment on changing cut-in speed
- Mitigation measures' examples

Birds

- Mitigation measure case study



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Portuguese recommendations

- prepared 2004
- updated several times
- last update 2009 (inc. EUROBATS guidelines 2008)
- <http://www.icnf.pt/portal/naturaclas/patrinatur/resource/docs/Mam/morc/morc-recom-p-eolic>
- planned update 2015 (inc. EUROBATS guidelines 2015)

Components

- roost inventory/monitoring
- habitat survey
- mortality



Portuguese recommendations

Roost inventory/monitoring

- search 10 km around wind farm
- > 10 bats or many signs: 1 visit per season
- many bats: inform Authorities

Habitat survey

- 2 areas (wind farm and control area)
- ground survey, monthly, March-October
- characterization of studying points
 - distance to turbines
 - temperature
 - orientation
 - land use
 - distance to water
 - distance to known roosts
- additionally recommended: height survey, radar, infrared camera



Portuguese recommendations

Mortality

- weekly, March-October
- radius minimum 50 m
- ideally with a dog (implemented in several wind farms)
- when > 40 turbines, at least 70% must be monitored (including near forests and cliffs)
- Carcass Removal rate
- Searcher Efficiency rate
- % searched area calculation (when it's not possible to search the whole area)



Portuguese recommendations

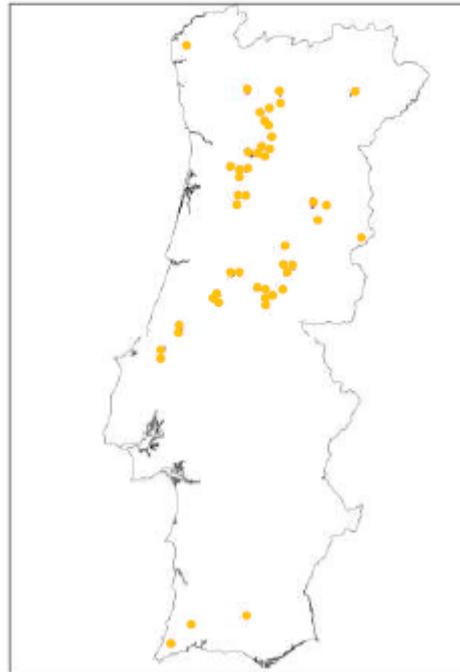
Roost inventory/ monitoring	1 year before construction during construction (recommended) 3 years after construction
Habitat survey	
Mortality	3 years after construction



Report on the effect of wind farms on bats in continental Portugal (2010)

<http://www.icnf.pt/portal/naturaclas/patrinatur/resource/docs/Mam/morc/parq-eol-morc-pt>

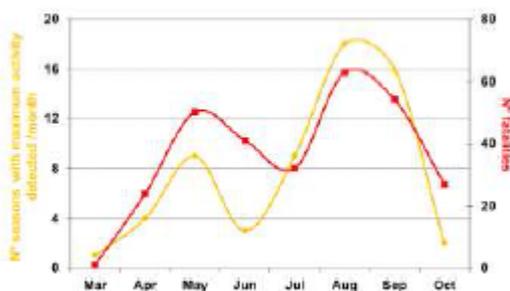
- 171 reports, 49 wind farms, 2001-2009
- analyses data from EIA procedures (including initial surveys and monitoring reports) and relates them to bibliographic information
- detailed analysis of methodology adequacy and data quality



Report on the effect of wind farms on bats in continental Portugal (2010)

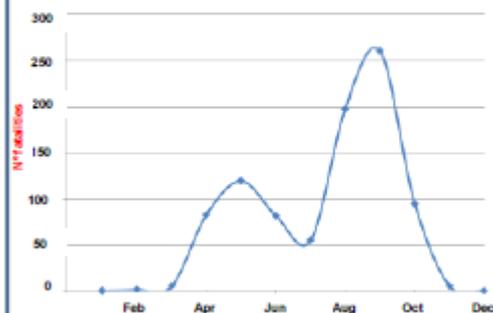
Some results from habitat survey and mortality data analysis:

- significant negative relation between activity and wind speed



- coincidence between higher mortality and higher activity per month

- 905 fatalities; at least 11 species; majority LC and DD



- most fatalities occur in early Autumn and Spring

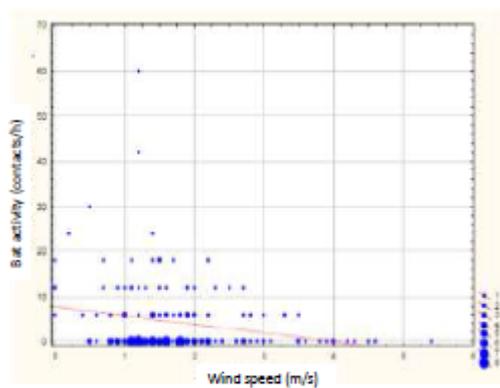
Update March 2015



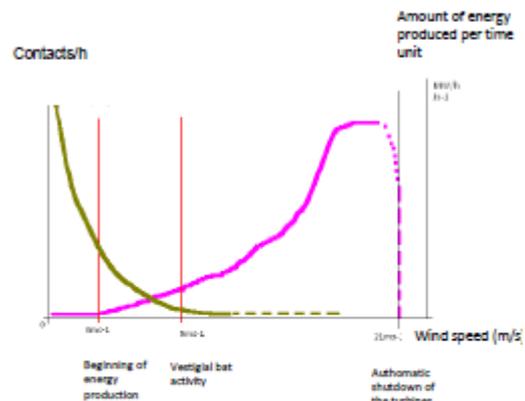
Recommendations
(planned update 2015)



Bats activity and wind speed



Source: Alves P, Silva B, Barreiro S (2012) Parque Eólico de Mosqueiros II. Monitorização de Quirópteros. Relatório 3 - Anos de 2010 e 2011 (relatório final). Fase de Exploração. Plecotus, Lda., Pombal, 92 pp.



Source: Jacinto Diamantino (ICNF)

Monitoring results indicate that bats activity decreases with increasing wind speed



Experiment on changing cut-in speed

- Wind farm Outeiro, 15 turbines
- fatalities 2006 (n= 12) and 2008 (n= 20), particularly in Autumn
- no activity detected > 3,2 m/s (ground)

15 September - 15 October 2010:

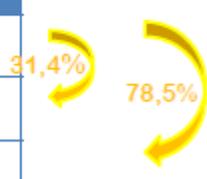
- 6 turbines cut-in speed 3,3 m/s
 - 2 mortality 2006 and 2008
 - 2 mortality 2006 or 2008
 - 2 no mortality
- daily search

Source: LEA. 2010. Monitorização dos efeitos da Medida de Minimização de Mortalidade do Parque Eólico do Outeiro. Relatório final. Laboratório de Ecologia Aplicada da Universidade de Trás-os-Montes e Alto Douro. Vila Real, 78 pp.



Experiment on changing cut-in speed

- 8 observed fatalities
 - 6 *P. pipistrellus* + 2 *N. leisleri*
 - 1 changed speed + 7 normal speed (3,0 m/s)
- estimated mortality for the monitored period
 - 0,332 bats/turbine (changed speed)
 - 1,554 bats/turbine (normal speed)

	Estimated mortality (all turbines)	
15 turbines "normal"	23.31	
6 turbines cut-in 3,3 m/s; 9 turbines "normal"	15.99	
15 turbines cut-in 3,3 m/s	4,98	

Source: LEA. 2010. *Monitorização dos efeitos da Medida de Minimização de Mortalidade do Parque Eólico do Outeiro. Relatório final. Laboratório de Ecologia Aplicada da Universidade de Trás-os-Montes e Alto Douro. Vila Real, 78 pp.*



Mitigation measures' examples

Wind farm located 158 m from a hibernation roost National Importance

- turbine cut-in speed 5 m/s; all night; October-December, March-April
- search weekly
- shrub cut, to increase search area
- evaluation / decision

Wind farm located 7 km from a all-year roost National Importance

- turbine cut-in speed 3,3 m/s; all night; all year
- search weekly
- shrub cut, to increase search area
- evaluation / decision



Appropriate assessment and mitigation of impacts of wind farms on flying vertebrates

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Mitigation measure case study

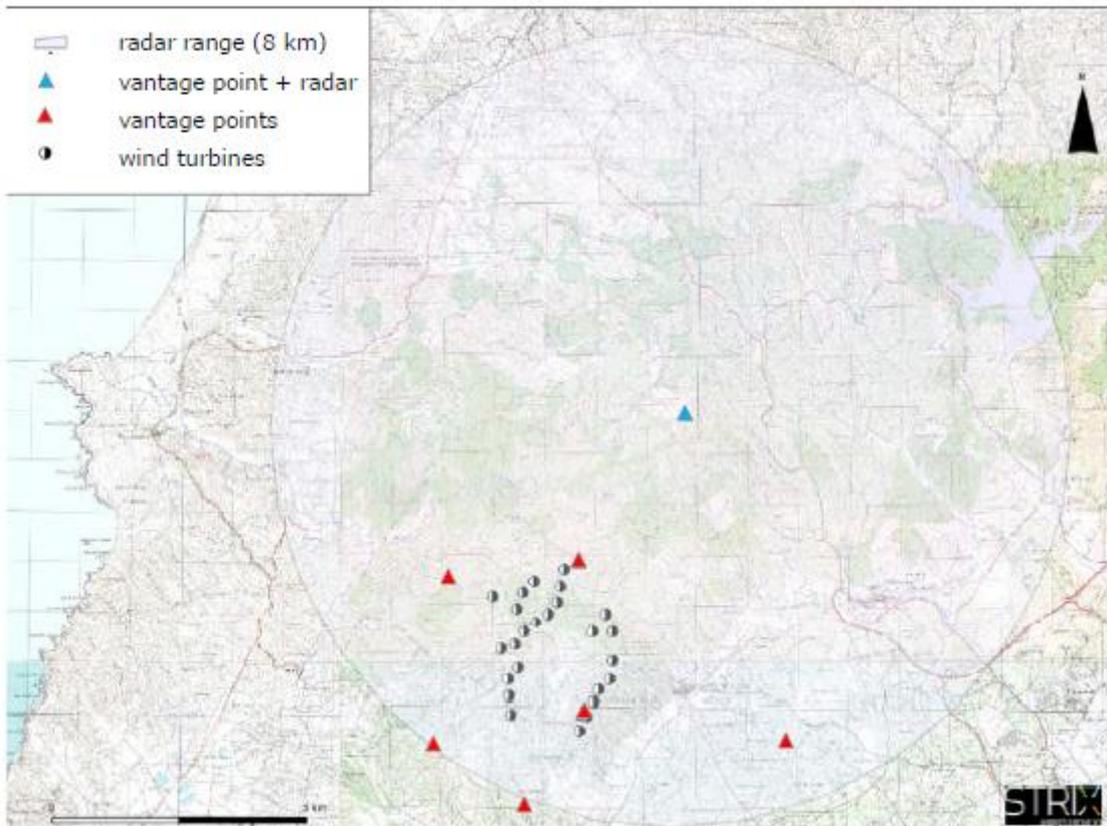
Wind farm Barão de São João

Wind farm located in a migratory flyway (36 species of soaring birds; 4000-5000 individuals/year)

- radar and visual surveillance
- turbine temporary shutdown on demand during autumn migration (15 August – 30 November)
- long-term monitoring of migratory soaring birds
- 7 vantage points + radar detection and following
- search twice a month (August-February) or once a month (March-July)
- evaluation / decision







Radar assisted shutdown on demand (RASOD)



Griffon vultures and shutdown operation



Wind turbine shutdown allows a flock of Griffon Vultures to surpass the wind farm safely

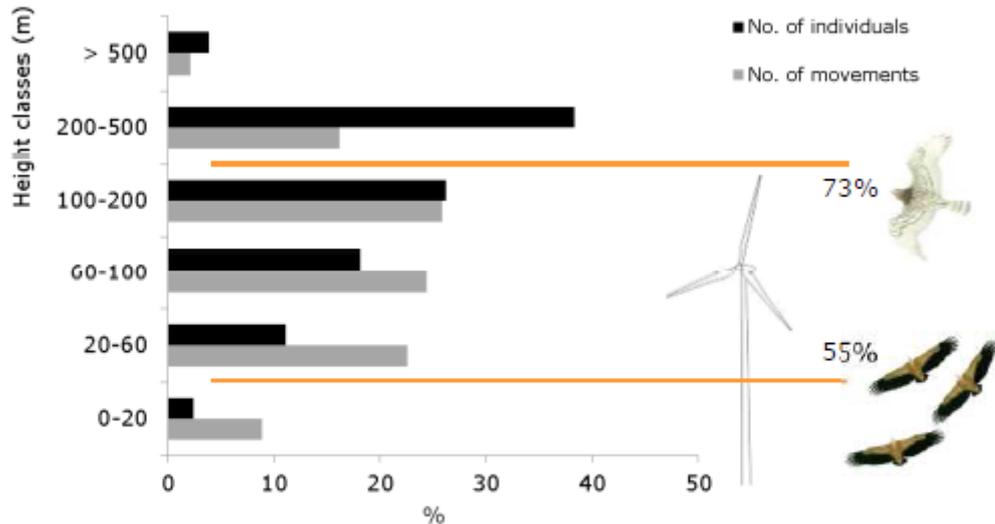


Migration at the wind farm area

Year	No. species	No. movements	No. individuals
2010	29	3210	37 698
2011	30	3096	20 095
2012	28	4005	30 271
2013	28	3750	26 015
2014	27	3282	10 630
Average	28	3469	24 942



Flight heights



73% of the soaring birds used high and moderate risk flight heights (20 - 200 m)



Collision risk

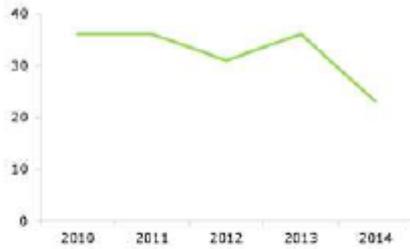
Year	Distance buffer to turbine (m)	No. crossings	No. individuals
2010	45	84	834
	90	313	1769
2011	45	50	576
	90	215	1332
2012	45	63	84
	90	278	772
2013	45	116	1297
	90	313	2497
2014*	45	11	59
	90	47	103
Total	45	324	2850
	90	1166	6473

* only 1/3 data analysed

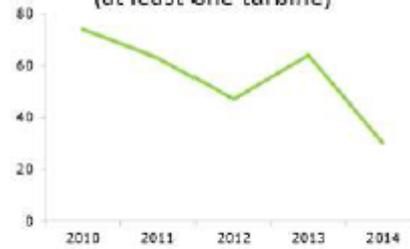


RASOD results

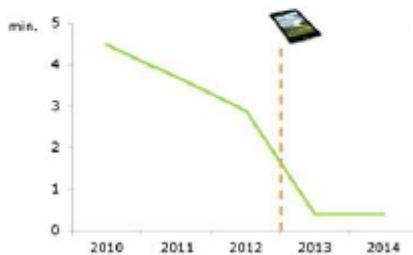
No. of days with shutdowns



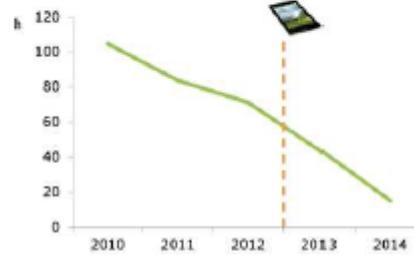
No. of shutdowns
(at least one turbine)



Time until shutdown after the order



Equivalent shutdown period

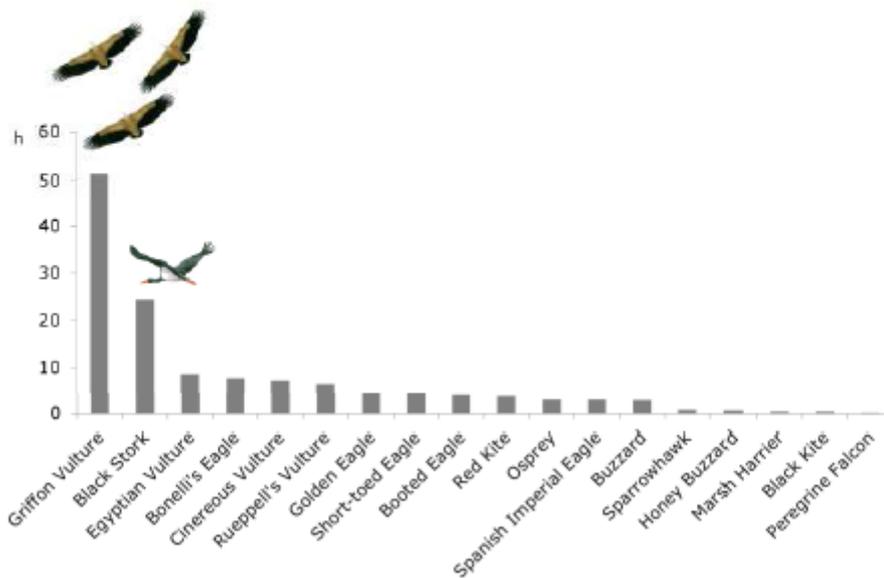


Direct access to the wind farm SCADA system by the monitoring team avoids unnecessary shutdowns and reduces shutdown hours



RASOD results

Equivalent shutdown period per species (annual average)



Conclusions

- Temporary (on demand) turbine shutdown is extremely efficient in avoiding collision mortality (zero mortality of soaring birds 2010-2014)
- Radar and vantage points surveillance contribute decisively to bird detection



Conclusions

- RASOD is avoiding the mortality of a probably high number of soaring birds every autumn
- RASOD efficiency benefits from the experience accumulated by the monitoring team
- Direct access to the wind farm SCADA system by the monitoring team reduces drastically shutdown hours



Conclusions

- RASOD high responsiveness avoids unnecessary shutdowns, resulting in equivalent shutdown periods between 0,1 – 1% of annual available equivalent time
- Losses in energy production are negligible when compared to nature conservation gains



Acknowledgements:

AgriPro Ambiente
Bio 3
Biota
Colmus
Ecomind
Ecosativa
Ecosfera
EDP
ENEOP 2
EolFlor
LEA / UTAD
Mãe d'Água
Naturibérica
Noctula
Plecotus
Procesl
Profico Ambiente
ProSistemas
Strix
Tecneira

Ana Rainho
Jacinto Diamantino
Jorge Safara
Marco Mirinha
Marta Borges
Nuno Martins
Nuno C. Vieira
Pedro Alves



Thank you very much!