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Phase 1 of the Impact Assessment of Proposals for a Revised IPPC Directive

Part 2: Intensive Livestock Final report

May 2008



Llywodraeth Cynulliad Cymru
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Executive Summary

Introduction

The Commission has published its proposal and an impact assessment for a Directive on industrial emissions (Industrial Emissions Integrated Pollution Prevention and Control, IE(IPPC)D¹) on 21st December 2007, which consolidates seven existing Directives related to industrial emissions into a single clear and coherent legislative instrument and includes a number of changes related to new and existing activities. The main objective of this report is to assess, in outline, the likely impacts of the proposal in relation to intensive agriculture installations within the UK. In particular, this report focuses on the proposed changes relating to the definition of intensive poultry installations and the spreading of manure.

Proposed changes

Poultry installations

The Commission's review identified a specific problem with regards to the scope of the current IPPC Directive in that the same threshold (40,000 places) is currently applied for all poultry installations irrespective of the actual species being reared. Different species produce different quantities of manure and slurry (and hence different ammonia emissions) which is not reflected in the current approach. Therefore Annex I of the proposed IE(IPPC)D (which sets out the activities covered by the Directive) now includes a disaggregated threshold for poultry broken down by species (Activity 6.6 concerning the intensive rearing of poultry or pigs):

- 40,000 places for broilers;
- 30,000 places for laying hens;
- 24,000 places for ducks;
- 11,500 places for turkeys.

In addition, the proposed Directive includes a provision for species other than those listed above in that a threshold should be calculated on the basis of equivalent nitrogen excretion factors compared to the thresholds above.

In the UK, an estimated 254 poultry installations are likely to be affected by the proposed changes to the IPPC poultry threshold. Business As Usual (BAU) ammonia emissions from

¹ "Proposal for a Directive of the European Parliament and of the Council on industrial emissions (integrated pollution prevention and control) (recast)". European Commission, Brussels, 21st December 2007. Available from: <http://ec.europa.eu/environment/ippc/proposal.htm>

these installations are estimated at approximately 3kt per year (from housing, manure storage and land spreading).

Manure spreading

The review of the IPPC Directive also identified that under the current definitions, the spreading of manure is generally not covered by the process as it often does not take place on the site of the main IPPC activity (intensive rearing of pigs or poultry). This is because intensive livestock installations may have little land on which to spread it, and so the manure is exported to other farms or, in the case of some poultry installations, to power stations. Therefore, in these circumstances, operators are not required to carry out Best Available Techniques (BAT)-based manure spreading.

To address this issue Article 16(4) of the IE(IPPC)D includes proposals for BAT to be applied to the spreading of manure and slurry outside of an IPPC installation. The Directive also states that “...*Member States may include those requirements in measures other than a permit.*”

In the UK, approximately 610kt of pig slurry and 2,600kt of pig and poultry manure are estimated to be currently exported from IPPC regulated sites each year. Approximately 670kt of poultry manure is currently exported to power stations for combustion so the remaining slurry and manure exported (450kt and 1,900kt, respectively) represents the maximum amount that may currently not be spread according to BAT and so would be affected by the proposed changes in the IE(IPPC)D. However, some farms are situated in Nitrate Vulnerable Zones² (NVZs) as defined under the Nitrates Directive and may already be spreading slurry or manure according to BAT (although this is as defined in the Action Programme measures designed to minimise leaching into water, rather than emissions to air or BAT per se, although this may be the net effect). BAU ammonia emissions from the spreading of exported manure and slurry are approximately 5.6-18.6kt per year (depending on assumptions concerning BAU spreading).

Costs & benefits

Approach

Compliance costs for the poultry installations that may be affected by the proposed changes to the threshold have been estimated based on discussions with relevant stakeholders (for example, NFU) and published information on the potential measures that may be required and their associated costs. From discussions with the Environment Agency, the compliance costs for up to about 10% of the intensive livestock installations currently subject to the Directive may be further increased by additional measures needed to protect contiguous “Habitats Directive” sites, but the extent of those increases was not clear at the time this report had to be finalised. Therefore, within the timescales of this study it has not been possible to identify how many of

² Note that, prior to the current review, about 33% of the UK is covered by NVZs.

the estimated 254 installations which would become subject to IPPC would be affected in this way. Administrative costs have been estimated based on 2007/08 permit application and subsistence fees as well as estimates of time required and costs to complete and process application forms and maintain records etc. Key assumptions and data inputs for the poultry analysis are presented in Sections 5.1.1 and 5.2.1.

Compliance costs for the application of BAT to manure and slurry spreading off-site have been estimated following the approach outlined for poultry installations. The required BAT measures for spreading and their associated unit costs have been taken from Defra, 2006 and updated in consultation with Natural England, where necessary. These have been combined with the estimated manure volumes currently being exported off-site. A low and high scenario have been established for this analysis with the low scenario assuming that slurry/manure produced in a NVZ is already spread according to BAT and the high scenario that all exported manure/slurry is not spread according to BAT (excluding that sent to power stations). These costs would be incurred by the non-IPPC farms currently receiving and spreading manure/slurry. Administrative costs have been estimated following a similar approach to the analysis for poultry installations. It must be noted that there are a number of uncertainties relating to the way in which the proposed change could be implemented and regulated.

In order to estimate the benefits associated with the proposed changes for agricultural installations, the potential reductions in ammonia emissions need to be calculated. These have been estimated based on discussions with key stakeholders and published information on abatement efficiency of particular techniques. Due to the tight timescales involved for the preparation of this report, it has not been possible to undertake detailed environmental and health impacts modelling. Therefore, the potential benefits (damage costs avoided) that may be realised if the calculated ammonia emission reductions are achieved have been estimated through the application of the damage cost functions developed by the Defra-led Interdepartmental Group on Costs and Benefits (IGCB)^{3,4}. For comparison with the European Commission's EU-wide impact assessment, potential benefits have also been estimated using the cost-benefit analysis developed under the CAFE programme⁵.

Poultry installations

The compliance and administrative costs that affected livestock farmers and regulatory authorities may incur due to the proposed changes are summarised in Table 1 below.

³ AEAT (2006): Damage costs for air pollution. Final report to Defra, March 2006. Available from: <http://www.defra.gov.uk/environment/airquality/publications/stratreview-analysis/damagecosts.pdf>

⁴ IGCB (2007): Economic analysis to inform the Air Quality Strategy. Final report, July 2007. Available from: <http://www.defra.gov.uk/environment/airquality/publications/stratreview-analysis/index.htm>

⁵ Available from: http://www.cafe-cba.org/assets/marginal_damage_03-05.pdf

Table 1 Summary of compliance and administrative costs for inclusion of additional poultry installations¹

Cost element	Total annualised cost (£million per year)	Average annual cost per installation (£k per year)
Compliance costs	1.9	7.5
- operators	1.9	7.5
Administrative costs	1.1-1.3	4.3-5.3
- operators	1.1-1.3	4.2-5.1
- regulatory authorities	0.04	0.2
Total	3.0-3.2	11.8-12.8
- operators	3.0-3.2	11.7-12.6
- regulatory authorities	0.04	0.2

Note 1: Note that total costs may not exactly match the sum of disaggregated costs due to rounding.

The estimated compliance cost per farm per year (£7.5k) compares favourably with the Commission's analysis which estimated compliance costs to be approximately €11.1k (£8.4k) per farm per year (based on total annual compliance costs of approximately €10 million (£7.7 million) for around 900 farms excluding administrative costs). With the inclusion of administrative costs the cost per farm estimated in this study rises to approximately £12-13k per year.

The estimated emission reductions and associated benefits are presented in the table below; benefits have been calculated separately based on the damage cost functions (central estimates) developed by the Defra-led IGCB and those developed by the European Commission under the CAFE programme. The benefits associated with the low and high damage cost estimates are presented in brackets for sensitivity.

Table 2 Summary of emission reductions and associated benefits from inclusion of additional poultry installations

BAU ammonia emissions from affected installations (kt/year)	Ammonia emission reductions (kt/year)	Benefits (damage costs avoided) (£million/year)
3.3	0.8-1.2	<ul style="list-style-type: none"> • Based on IGCB damage cost functions: 1.6-2.3 (1.3-2.6) • Based on CAFE damage cost functions: 21.0-29.4 (10.7-43.9)

The estimated compliance costs and reduction in emissions gives a cost effectiveness of approximately £2,500-3,800 per tonne of ammonia abated. The Commission's IA presented an abatement cost of €1,000 per tonne of ammonia abated (~£770) although this excluded any administrative costs and assumed a greater reduction in emissions on average per installation (11 tonnes of ammonia reduced per year per installation compared to 4-5 tonnes estimated from the analysis for this study). Where ammonia that is not lost to the atmosphere is successfully harnessed as a nutrient for the benefit of crops, there will be savings in the costs of purchased fertilisers paid by farmers. Given the short timescales of the project it has not been possible to estimate the savings in fertiliser costs to farmers. It is assumed that public consultation would be used to request comments and suggestions for the estimated savings in fertiliser costs.

Table 3 provides an overview of costs and benefits for comparison. The total costs (compliance and administrative) that may be incurred by the poultry installations likely to be affected by a change in the IPPC threshold and the regulatory authorities are slightly higher than the associated benefits calculated using the IGCB damage cost functions. However, they are significantly lower (by an order of magnitude) than the benefits calculated by applying the CAFE values.

Table 3 Overview of total costs and benefits associated with inclusion of additional poultry installations

Total annualised cost (£million per year)	Benefits (damage costs avoided) (£million/year)
3.0-3.2	<ul style="list-style-type: none"> • Based on IGCB damage cost functions: 1.6-2.3 (1.3-2.6) • Based on CAFE damage cost functions: 21.0-29.4 (10.7-43.9)

Manure spreading

The compliance and administrative costs that exporting and receiving installations and regulatory authorities may incur due to the proposed changes are summarised in the table below.

Table 4 Summary of compliance and administrative costs for application of BAT to manure spreading¹

Cost element	Total annualised cost (£million per year)
Compliance costs	2.2-7.5
- operators	2.2-7.5
Administrative costs	0.08-0.1
- operators	0.08-0.1
- regulatory authorities	<i>Assuming costs covered by variation fee paid by operators</i>
Total	2.3-7.6
- operators	2.3-7.6
- regulatory authorities	<i>Assuming costs covered by variation fee and existing subsistence fees paid by operators under IPPC</i>

Note 1: Note that total costs may not exactly match the sum of disaggregated costs due to rounding.

Total compliance and administrative costs are estimated to be approximately £2.6-8.5 million per year if scaled to include potential impacts in Scotland and Wales. However, this is highly uncertain due to a lack of available data for Scotland and Wales (see Section 4.1.2 for details of approach to scaling).

The compliance costs outlined above would be incurred by the non-IPPC farms currently receiving and spreading manure/slurry as they would have to spread according to BAT. The estimated compliance cost per farm is difficult to calculate as it is not known exactly how many non-IPPC farms may be receiving and spreading manure/slurry. Assuming that just over 550 farms are currently exporting manure/slurry and each farm only exports to a single non-IPPC farm then the average cost per farm would be approximately £3.9-13.2k per. In reality the costs per farm may be slightly lower if an IPPC farm exports manure/slurry to more than one non-IPPC farm, but it is also likely that a poultry/pig farmer would export to more than one neighbour. The additional costs for land spreading on non-IPPC sites may lead to a reduction in demand for manure/slurry that could result in the producing farms having to spread greater amounts on-site (if this is possible) rather than exporting. If such a farmer is in an NVZ, there

may be difficulties keeping within the whole farm and individual field limits for nitrogen applied from organic sources. If this were the case then the compliance costs presented above would be incurred by existing IPPC installations and could be considerable.

In addition, it is important to note that, at this stage, it is unclear exactly how this proposed change would be implemented and enforced. There may also be some administrative costs for those farms receiving and spreading manure/slurry (for example, record keeping demonstrating that BAT have been applied). Therefore, the costs presented may be underestimated if operators (IPPC and non-IPPC farms) and/or the regulatory authorities have to take any further actions to ensure compliance beyond those highlighted in Section 5.1.2.

The estimated emission reductions and associated benefits are presented in the table below; benefits have been calculated separately based on the damage cost functions (central estimates) developed by the Defra-led IGCB and those developed by the European Commission under the CAFE programme. The benefits associated with the low and high damage cost estimates are presented in brackets for sensitivity.

Table 5 Summary of emission reductions and associated benefits from application of BAT to manure spreading

BAU ammonia emissions from affected installations (kt/year)	Ammonia emission reductions (kt/year)	Benefits (damage costs avoided) (£million/year)
5.6-18.6	2.8-9.1	<ul style="list-style-type: none"> Based on IGCB damage cost functions: 5.5-17.9 (4.3-20.3) Based on CAFE damage cost functions: 70.7-231.6 (35.9-345.7)

Total emission reductions and associated benefits may be approximately 10% higher if scaled to include potential impacts in Scotland and Wales although this is highly uncertain due to a lack of available data for Scotland and Wales.

The estimated compliance costs and reduction in emissions gives a cost effectiveness of approximately £800 per tonne of ammonia abated. The Commission's IA presented an abatement cost of €2,400 per tonne of ammonia abated (~£1,800). Differences in costs may be related to different interpretations of BAT for manure/slurry spreading and the fact that the Commission's cost estimates are for the EU as a whole that may not necessarily reflect the situation in the UK. Applying the Commission's estimated abatement cost gives a total cost of £5-16 million per year.

Table 6 provides an overview of costs and benefits for comparison. The total costs (compliance and administrative) that may be incurred by IPPC farms exporting manure/slurry and non-IPPC farms receiving and spreading manure/slurry with the application of BAT are lower by approximately 50% than the associated benefits calculated using the IGCB damage cost functions. In addition, they are significantly lower than the benefits calculated by applying the CAFE values. However, it is important to highlight the administrative costs which may be under-estimated due to the uncertainties surrounding the way in which the proposed change could be regulated. It is also worth bearing in mind that proposed changes to the NVZ regulations in England means that farmers in an NVZ will be required to keep adequate records, risk assessment etc. Therefore some of these administrative burdens may in fact already be done (i.e. business as usual).

Table 6 Overview of total costs and benefits associated with application of BAT to manure spreading

Total annualised cost (£million per year)	Benefits (damage costs avoided) (£million/year)
2.3-7.6	<ul style="list-style-type: none"> • Based on IGCB damage cost functions: 5.5-17.9 (4.3-20.3) • Based on CAFE damage cost functions: 70.7-231.6 (35.9-345.7)

Limitations/uncertainties

There are a number of limitations and uncertainties with the approach applied and input data available that should be noted:

- The benefits presented based on the IGCB damage cost functions only relate to those that may be realised in the UK if the UK were to adopt the proposed changes in the IE(IPPC)D. They do not take into account the additional benefits that may be achieved in the UK from the rest of the EU implementing the proposed changes and vice-versa (i.e. transboundary impacts);
- There are a number of additional benefits that may be realised which cannot be quantified at this stage. For example, a reduction in ammonia emissions will also result in reductions in odour emissions and a reduction in the cost of fertiliser. In addition, the damage cost functions applied to estimate the benefits associated with a reduction in ammonia emissions do not include all benefits such as impacts on ecosystems or cultural heritage;
- Applying damage cost function to estimate benefits does not take into account the geographical location of farms where these reductions are taking place (for example,

reductions in emissions from a poultry farm close to a highly populated area will result in greater health benefits (e.g. reduction in respiratory irritation and reduce the susceptibility of children to respiratory infection) than a farm located further away);

- Relatively limited data was available on the volumes of manure currently being exported from IPPC to non-IPPC installations for spreading and the BAU techniques being applied and the reactions that changes in the IPPC rules would invoke amongst affect exporting/importing installations. Therefore, the figures presented in the report only relate to England and Northern Ireland although rough estimates of impacts across the UK have also been presented by applying scaling factors derived from the UK ammonia emissions inventory. In addition, there is significant uncertainty as to how the proposed changes related to manure spreading off-site may actually be implemented and regulated.

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1. Introduction

1.1 This report

The overall aim of this work package is to provide support to Defra in response to the publication of the European Commission's proposal for a new Directive on industrial emissions. This work will be undertaken under Entec's framework contract with Defra on "*The Preparation of Regulatory Environmental Impact Assessments in Relation to Proposals for Air Quality Legislation*" contract (RIA). The main objective of this report is to assess the likely impacts of the proposal in relation to intensive livestock installations within the UK, building and commenting on as well as extending the Commission's Impact Assessment (IA), where appropriate. In particular, this report focuses on the proposed changes relating to the definition of intensive poultry installations and the spreading of manure from IPPC regulated livestock installations.

The project team has consulted with the following stakeholders to support the development of this report:

- Environment Agency for England & Wales (EA);
- Scottish Environment Protection Agency (SEPA);
- Department of Environment, Northern Ireland (DOENI);
- Department of Agriculture and Rural Development, Northern Ireland (DARDNI);
- British Poultry Council (BPC);
- National Farmers' Union (NFU);
- Natural England.

1.2 What is the issue?

1.2.1 Overview of revised IPPC Directive

The Commission has published its proposal and an impact assessment for a Directive on industrial emissions (Industrial Emissions Integrated Pollution Prevention and Control,

henceforth cited as “IE(IPPC)D”⁶) on 21st December 2007, which consolidates seven existing Directives related to industrial emissions into a single clear and coherent legislative instrument. These existing Directives include titanium dioxide industry related directives (78/176/EEC, 82/883/EEC, 92/112/EEC), the IPPC Directive (96/61/EC), the Solvent Emission Directive (1999/13/EC), the Waste Incineration Directive (2000/76/EC) and the LCP Directive (2001/80/EC). The Commission’s IA⁷ identified a number of problems related “(1) to shortcomings in the current legislation that lead to unsatisfactory implementation and difficulties in Community enforcement actions and, thereby, to loss of health and environmental benefits and (2) to the complexity and lack of coherence of parts of the current legal framework.”

The Commission has provided an indicative timeline for discussion and implementation of the proposals. It is important to note that this is dependent on the length of time it takes to discuss and agree the proposed directive within the co-decision procedure. The initial timetable is set out below in Table 1.1.

Table 1.1 Key dates for the discussion and implementation of the proposed IE(IPPC)D

Date	Description
12/2007	The Commission adopts its proposal for a Directive on industrial emissions as well as issuing its Communication ‘Towards an improved policy on industrial emissions’
01/2009	First reading in the European Parliament and political agreement in Council.
12/2010	Completion of the co-decision process and publication of the Directive on industrial emissions within the Official Journal.
07/2012	Member States fully transpose the new Directive (18 months after entry into force). The Directive applies to all new installations from this date onwards.
01/2014	All existing installations previously subject to IPPC, Waste Incineration, Solvent Emissions and Titanium Dioxide Directives must meet the requirements of the new Directive. Large Combustion Plants do not yet need to meet the new Emission Limit Values (ELVs) prescribed within the Directive

⁶ “Proposal for a Directive of the European Parliament and of the Council on industrial emissions (integrated pollution prevention and control) (recast)”. European Commission, Brussels, 21st December 2007. Available from: <http://ec.europa.eu/environment/ippc/proposal.htm>

⁷ “Commission Staff Working Document: Accompanying document to the Proposal for a Directive of the European Parliament and of the Council on industrial emissions (integrated pollution prevention and control) (recast). Impact Assessment.” European Commission, Brussels, 21st December 2007. Available from: <http://ec.europa.eu/environment/ippc/proposal.htm>

Table 1.1 (continued) Key dates for the discussion and implementation of the proposed IE(IPPC)D

Date	Description
07/2015	The newly prescribed activities such as additional poultry installations, smaller combustion units and wood preservation activities must meet the requirements of the new Directive.
01/2016	Large Combustion Plants must meet the requirements set out in Chapter 2 of the new Directive, as well as the ELVs set out in Annex V

It is unclear from the Commission’s proposals exactly when the application of BAT to manure spreading off-site would come into force. For the purposes of this study it has been assumed that they would come into force at the same time as the change to the poultry threshold (i.e. 2015).

1.2.2 Proposed changes: poultry installations

The Commission’s review identified a specific problem with regards to the current scope of the IPPC Directive in that the same threshold (40,000 places) is currently applied for all poultry installations without any consideration of the actual species being reared. Different species produce different quantities of manure and slurry (and hence different ammonia emissions) which is not reflected in the current approach.

Therefore Annex I of the proposed IE(IPPC)D (which sets out the activities covered by the Directive) now includes a disaggregated threshold for poultry, broken down by species (Activity 6.6 concerning the intensive rearing of poultry or pigs):

- 40,000 places for broilers;
- 30,000 places for laying hens;
- 24,000 places for ducks;
- 11,500 places for turkeys.

In addition, the proposed directive includes a provision for species other than those listed above in that a threshold should be calculated on the basis of equivalent nitrogen excretion factors compared to the thresholds above.

1.2.3 Proposed changes: manure spreading

The review of the IPPC Directive also identified that, under the current definitions, the spreading of manure is generally not covered by the process as it often does not take place on the site of the main IPPC activity (intensive rearing of pigs or poultry). This is because intensive livestock installations may have little land on which to spread it, and so the manure is exported to other farms or, in the case of some poultry installations, to power stations. Therefore, in these circumstances, operators are not required to carry out Best Available Techniques (BAT)-based manure spreading.

To address this issue Article 16(4) of the IE(IPPC)D includes proposals for BAT to apply to the spreading of manure and slurry outside of an IPPC installation. The Directive also states that “...*Member States may include those requirements in measures other than a permit.*”

1.3 What are the objectives and intended effects?

The main drivers for the revision of industrial emissions legislation are described in the IA undertaken by the Commission:

- the Lisbon Strategy and the EU Sustainable Development Strategy; this strategy stresses the role of environmental technologies in having “*significant economic, environmental and employment potential*”;
- the different Thematic Strategies (Air Pollution, Soil Protection etc.) set objectives to protect human health and the environment from key air pollutants. Industrial emissions regulation has a major role in meeting these objectives;
- the need for “Better Regulation” and designing laws and legislation in a more coherent way and with minimum administrative burden; and
- experience in the implementation of the IPPC Directive in the last 10 years and ways to improve the legal framework to ensure that its objectives are met.

The Commission’s proposals aim to address the issues identified via a number of amendments to the existing legislation including the following:

- clarification and strengthening of the concept of BAT;
- revision of the minimum ELVs for some sectors (for example, large combustion plants) to bring them into line with BAT standards;
- introduction of provisions on inspection and environmental improvements;
- stimulating innovation and the development and deployment of new techniques;

- simplifying and clarifying certain provisions on issuing permits, monitoring and reporting to cut unnecessary administrative burdens; and
- extending and clarifying the scope and provisions of the legislation to better contribute to the objectives of the Thematic Strategies.

The first and last points presented above relating to strengthening of the BAT concept and the clarification and extension of the scope and provisions of the existing legislation are most relevant to the changes concerning intensive agricultural installations. The Commission's modelling has found that for the objectives of the Thematic Strategy on Air Pollution (TSAP) to be achieved then a further reduction of 850kt of ammonia needs to be reduced in the agricultural sector across the EU by 2020 (compared to the BAU situation i.e. under current legislation). If BAT was properly implemented according to the intensive agriculture BREF⁸, then the modelling estimates that the installations currently included under the existing Directive could reduce their ammonia emissions by 130kt in total compared to the baseline. Two specific studies were undertaken for the Commission as part of the review of the Directive to identify the most cost-effective measures in the agricultural sector to achieve the objectives of the TSAP^{9,10}. The measures considered related to the implementation of the IPPC Directive as well as other related legislation including the Water Framework and Nitrates Directives.

For the proposed change to the threshold for poultry installations, the analysis found that only a small number of farms would be affected across the EU (approximately 900) resulting in a reduction in ammonia emissions of approximately 10kt per year. The total annual compliance costs have been estimated to be less than €10 million (£7.4 million) giving an average cost of reducing ammonia emissions around €1,000 (£740) per tonne. Administrative costs were estimated to be *"...in the same order of magnitude than for the current IPPC farms and would ensure a more level playing field in this sector since the current IPPC thresholds exclude certain poultry installations with similar or higher environmental impacts than IPPC installations."* For the application of BAT to manure spreading off-site, the analysis found that this could lead to significant reductions in ammonia emissions across the EU (approximately 50-60kt) with limited

⁸ Integrated Pollution Prevention and Control (IPPC). Reference Document on Best Available Techniques for Intensive Rearing of Poultry and Pigs. European Commission, July 2003. Available from: <http://eippcb.jrc.es/pages/FActivities.htm>

⁹ IIASA (2007): Measures in agriculture to reduce ammonia emissions. Final report to the European Commission, June 2007.

¹⁰ Alterra, Wageningen UR, Eurocare, University of Bonn and A&F (2007): Impact assessment of a possible modification of the IPPC Directive as regards intensive livestock rearing (part of a project on integrated measures in agriculture to reduce ammonia emissions). Final report for the European Commission, June 2007. Available from: http://circa.europa.eu/Public/irc/env/ippc_rev/library

impacts on other emissions (methane and nitrous oxide). The average cost of reducing emissions has been estimated to be approximately €2,400 per tonne abated (£1,800).

The combined impact of all of the proposed changes to the Directive (i.e. not just those relating to the agriculture sector) on administrative burden has been estimated to be approximately -€105 to -€255 million for Member States and operators (i.e. a net reduction of administrative burden). However, the proposed changes relating to agriculture will lead to an increase in administrative burden due to the addition of new activities; the main benefits will be realised by Member States and other industry sectors through the promotion of combined permitting and reduced unnecessary administrative burden.

From a UK perspective, the proposed changes would contribute towards meeting future targets related to ammonia emissions included in national (for example, the Air Quality Strategy) and international (for example, National Emission Ceilings Directive¹¹) legislation. They would also lead to a reduction in damage to the environment and impacts on human health. The health damage costs arising from ammonia emissions are likely to include a relatively small contribution arising from direct exposure to ammonia and a much greater component arising from exposure to secondary ammonium particles. This was not explored further due to data and time constraints.

¹¹ The National Emission Ceilings Directive (NECD, Directive 2001/81/EC) sets total caps for each Member State for absolute emissions of NO_x, SO₂, VOCs and ammonia. The current NECD includes ceilings for 2010 but this is currently being revised to set ceilings for each Member State to achieve by 2020; a ceiling for particulate matter will also be included.

2. Policy Options

This section presents the policy options considered in this report for the proposed changes in thresholds for intensive poultry installations and the application of BAT for manure spreading by third parties. These were discussed and agreed with Defra at the inception meeting (15th February 2008).

2.1 Poultry Installations

The following two options have been considered for intensive poultry installations:

- i. No change (i.e. poultry installations below the current 40,000 places threshold are not brought under IPPC);
- ii. As proposed in the IE(IPPC)D.

2.2 Manure Spreading

The following two options have been considered for manure spreading:

- iii. No change (i.e. manure spreading by third parties not subject to IPPC and application of BAT);
- iv. As proposed in the IE(IPPC)D.

3. Who is affected?

This section presents a list of those stakeholders likely to be affected by the proposed changes for intensive poultry installations and manure spreading.

3.1 Poultry Installations

- Managers of poultry installations currently falling outside of the scope of the IPPC Directive (i.e. <40,000 places) which will be affected by the proposed changes;
- Competent authorities e.g. Environment Agency, Scottish Environment Protection Agency (SEPA), Defra;
- Others.

3.2 Manure Spreading

- Managers of intensive pig and poultry installations included under the existing IPPC Directive;
- Managers of other farms currently not covered by IPPC which are accepting manure or slurry to spread from IPPC installations;
- Competent authorities e.g. Environment Agency, Scottish Environment Protection Agency (SEPA), Defra;
- Others.

4. Baseline Definition

4.1 Approach

This section outlines the approach that has been taken to define the baseline for the relevant installations and/or activities and their associated emissions that may be affected by the proposed changes to the Directive.

4.1.1 Poultry Installations

Number of installations

The Great Britain (GB) Poultry Register¹² is updated on a daily basis and provides the best available dataset for numbers and locations of holdings that keep 50 or more poultry (for England, Scotland and Wales only). Figures for Northern Ireland have been provided by the Department of Agriculture and Rural Development, Northern Ireland (DARDNI). The figures provided in Table 4.1 below provide an overview of the number of farms and bird places that are expected to be affected by the proposed changes to the poultry threshold.

Table 4.1 Overview of number of premises and bird places that would be affected by a change to the threshold (broken down by bird species)

Threshold range	No. premises	No. bird places
Turkey Farms with 11,500 – 40,000 birds	114	2,699,767
Chicken Layer farms with 30,000 – 40,000 birds	105	3,703,494

¹² The GB Poultry Register has been established by Defra, the Scottish Executive and the Welsh Assembly Government (and backed by the poultry industry) in order to gather and collate information about certain species of birds held on premises in Great Britain (chickens, turkeys, ducks, geese, partridges, quail, pheasants, pigeons (reared for meat), guinea fowl, ostriches, emus and rheas). The register has been established to ensure that sufficient information is available to help reduce the impact of a disease outbreak. Farmers are required by law to register if they own or are responsible for a poultry premises with 50 or more birds. Further information available from: <http://www.defra.gov.uk/animalh/diseases/vetsurveillance/poultry/index.htm>

Table 4.1 (continued) Overview of number of premises and bird places that would be affected by a change to the threshold (broken down by bird species)

Threshold range	No. premises	No. bird places
Duck Farms with 24,000 – 40,000 birds	35	1,166,123

The British Poultry Council (BPC) have noted that there may be other breeder farms that will be captured by the change, and that there is a trend for more free range (note that free range flocks are included within IPPC but not outdoor pigs) and smaller flocks in some areas.

We have assumed that at the sites affected, there is a similar split between male and female turkeys and layers (perchery and cages - deep pit or belt) as that of the total UK turkey and layer population (based on data from the UK ammonia emissions inventory and projections (IGER, version 3rd October 2007)).

Ammonia & dust emissions

The ammonia and dust emissions factors are provided in Annex 1 of the Form IPPC 2 Application for a Pig and Poultry Rearing Permit¹³. The following calculation was used to calculate the ammonia and dust emission contributions from poultry housing:

$$\text{Number of animal places} \times \text{Relevant emission factor} = \text{kg NH}_3 \text{ or dust per year}$$

In addition, the ammonia emissions associated with litter/manure storage and landspreading (on operator controlled land) can also be estimated based on the emission factors from Annex 1 of the form referred to above. These emission factors are based on the volume of manure rather than bird places. The volume of manure being produced by the affected installations can be estimated by applying standard excretion factors to the number of bird places. These factors are available in the EA's "Guidance for operators on manure management planning for IPPC installations"¹⁴.

¹³ Available from: http://www.environment-agency.gov.uk/commondata/acrobat/annex_1_ippc_1012521.pdf

¹⁴ Available from: <http://www.environment-agency.gov.uk/commondata/acrobat/manure.pdf>

Where required, emission factors have been weighted by data available (for example, split between male and female turkeys) from the UK ammonia emissions inventory and projections (IGER, version 3rd October 2007). The results are presented in Table 4.4 below.

Other pollutants

The Commission's IA and supporting analysis⁹ found the impacts of a revision to the IPPC threshold for poultry installations on emissions of other pollutants (for example, CH₄, N₂O) to be negligible for the UK so they have not been considered for the analysis.

4.1.2 Manure Spreading

Exported manure

In order to define the baseline in relation to the proposed changes for manure spreading, it is necessary to identify how much manure or slurry is currently being exported from IPPC installations and being spread off-site. Defra, 2006, presents an assessment of the expected costs of implementation of the IPPC Directive for agricultural installations in England¹⁵. This included an assessment of the volume of manure or slurry currently being produced at IPPC regulated pig and poultry installations as well as the volumes being exported off-site or spread on-site on grassland or arable land. Information on the number of farms exporting manure or slurry and associated volumes in Northern Ireland has been provided by the Department of Environment, Northern Ireland (DOENI)¹⁶. A summary of this data is presented in the table below. It is important to note that the same split that has been assumed for on-site spreading in Defra, 2006, (i.e. between grassland and arable land) has been applied to the manure or slurry being exported.

As outlined above the data presented in subsequent tables only refers to England and Northern Ireland. We have been unable to obtain data from SEPA and the EA (or any other relevant data sources). Using figures from the UK ammonia emissions inventory (IGER, 2007) as a proxy for numbers, England and Northern Ireland account for 89% of total poultry farms and 90% of total pig farms. Although the figures presented in this report relate primarily to England and Northern Ireland, upscaled costs and benefits based on the percentages above (to include Scotland and Wales) have also been presented to provide a rough estimate of the potential impacts for the UK as a whole. However, it is important to note that the upscaled results are based on total

¹⁵ Integrated Pollution Prevention and Control. Assessment of the cost of implementation of the directive for farm businesses in England. Report prepared by RDS for the Agricultural Policy Analysis Unit, Defra, February 2006.

¹⁶ Total annual production and % of manure/slurry being exported in NI only relates to installations currently landspreading (on-site or off-site).

farm numbers and may not reflect actual practices in Scotland and Wales in terms of the numbers of pig and poultry farms exporting manure or slurry for spreading by third parties (and associated volumes).

Table 4.2 Overview of manure/slurry production at IPPC installations and volume being exported off-site in England and NI (m³ or tonnes)¹

	Total annual production (m ³ /t)	%	Currently exported			Assumptions (based on Defra, 2006)
			Total volume (m ³ /t)	Spread on grassland (m ³ /t)	Spread on arable land (m ³ /t)	
Pig Slurries	1,994,412	England : 25% NI: 83%	608,767	304,384	304,384	50% spread on arable land & 50% spread on grassland
Pig Manures	705,884	England : 29% NI: 83%	205,742	20,574	185,168	90% spread on arable land & 10% spread on grassland
Layer & 'non' broiler manures	2,253,930	England : 69% NI: 97%	1,230,003 ²	123,000	1,107,002	90% spread on arable land & 10% spread on grassland. Assumes 335,000 tonnes of the exported material is sent to power stations for combustion (i.e. 50% of total amount currently sent to power stations ¹).
Broiler manures	2,093,426	England : 69% NI: 97%	1,119,255 ²	111,925	1,007,329	90% spread on arable land & 10% spread on grassland. Assumes 335,000 tonnes of the exported material is sent to power stations for combustion (i.e. 50% of total amount currently sent to power stations ¹).

Note 1: Data for England taken from Defra, 2006¹⁵ and Northern Ireland data provided by DOENI.

Note 2: Excludes 670,000 tonnes currently exported from poultry installations for incineration in power plants (assumed split equally between broiler and layer manures).

The volumes presented in the table above represent the maximum volume of manure and slurry that is currently being exported off-site in England and Northern Ireland which may not be spread according to BAT. However, this is likely to be an overestimate as many of the sites receiving manure and/or slurry from IPPC regulated installations may in fact already be applying BAT (or similar) for spreading manure (for example, due to their location in a Nitrates Vulnerable Zone (NVZ) or because they are following the Codes of Good Agricultural Practice for the Protection of Air, Water and Soil¹⁷). Defra, 2006, estimated the number of businesses, poultry population and places and manure/slurry production located within and outside of an NVZ. These figures can be applied to those presented in Table 4.2 to establish an alternative baseline, based on the assumption that manure and slurry being produced in an NVZ will be spread according to BAT. For Northern Ireland it has been assumed that all installations are within an NVZ due to the whole territory approach to the Nitrates Directive.

Table 4.3 Overview of manure/slurry production at IPPC installations in England and NI and volume being exported off-site (taking into account potential impacts of NVZs) (m³ or tonnes)

	Total annual production (m ³ /t)	Currently exported		Exported volume spread in NVZ according to BAT		Exported volume not spread in NVZ according to BAT	
		%	Total (m ³ /t)	%	Total (m ³ /t)	Spread on grassland (m ³ /t)	Spread on arable land (m ³ /t)
Pig Slurries	1,994,412	England : 25% NI: 83%	608,767	England : 77% NI: 100%	506,576	51,096	51,096
Pig Manures	705,884	England : 29% NI: 83%	206,081	England : 77% NI: 100%	159,185	4,656	41,901
Layer & 'non' broiler manures	2,253,930	England : 69% NI: 97%	1,230,003 ¹	England : 68% NI: 100%	849,812	38,019	342,171

¹⁷ See: <http://www.defra.gov.uk/farm/environment/cogap/index.htm>

	Total annual production (m ³ /t)	Currently exported		Exported volume spread in NVZ according to BAT		Exported volume not spread in NVZ according to BAT	
		%	Total (m ³ /t)	%	Total (m ³ /t)	Spread on grassland (m ³ /t)	Spread on arable land (m ³ /t)
Broiler manures	2,093,426	England : 69% NI: 97%	1,119,255 ¹	England : 68% NI: 100%	774,273	34,498	310,483
Note 1: Excludes 670,000 tonnes currently exported from poultry installations for incineration in power plants (split equally between layer/'non' broiler and broiler manures).							

In the absence of more detailed information on the proportion of manure and slurry currently being exported off-site and spread according to BAT, we have applied the figures presented in Table 4.2 and Table 4.3 to represent a low and high scenario in this study.

Estimating the number of farms that may be affected by the proposed change is much more uncertain as the total number of farms currently exporting manure and/or slurry is not available for England. However, some good indications can be gained from the Farm Practices Survey 2001 (Defra 2002). According to the survey, 78% of pig and 56% of poultry farms included in the survey exported manure and/or slurry in 2001 (151 and 277 farms respectively). Data provided by DOENI indicates that 36 farms currently export manure and/or slurry to a third party for landspreading in Northern Ireland. Assuming that the situation has not changed markedly since the Farm Practices survey (in the absence of any other reliable data), then this gives the following estimate of the number of sites affected in England and Northern Ireland:

- 173 pig installations;
- 395 poultry installations (excluding the 670,000 tonnes that is being sent direct to power stations for combustion).

Ammonia emissions

Ammonia emissions associated with the landspreading of pig and poultry manure or slurry can be estimated by the application of the relevant emission factors from Annex 1 of the Form IPPC 2 Application for a Pig and Poultry Rearing Permit¹³.

Other pollutants

The Commission's IA and supporting analysis⁹ found the impacts of the application of BAT to landspreading of manure and slurry on emissions of other pollutants (for example, CH₄, N₂O) to be negligible for the UK so they have not been considered for the analysis.

4.2 Results

4.2.1 Poultry Installations

Ammonia emissions

The tables below provide estimations of ammonia emissions from the poultry installations likely to be affected by the proposed change to the threshold (broken down by emissions from housing, litter/manure storage and landspreading). These have been estimated based on the methodology and assumptions described above.

Table 4.4 Estimation of BAU ammonia emissions from affected poultry installations (housing)

Category	No. premises	No. bird places	Ammonia emission factor (kg/bird place/year) ^{1,2}		Ammonia emissions (kt/year)
Turkey Farms with 11,5000 – 40,000 birds	114	2,699,767	Male Turkeys – Litter	0.44	
			Female Turkeys - Litter	0.22	
			Weighted	0.33	0.891
Chicken Layer farms with 30,000 – 40,000 birds	105	3,703,494	Layers – Perchery	0.29	
			Layers – Cages (Deep Pit)	0.29	
			Layers – Cages (Belt)	0.12	
			Weighted	0.20	0.724

Table 4.6 (continued) Estimation of BAU ammonia emissions from affected poultry installations (housing)

Category	No. premises	No. bird places	Ammonia emission factor (kg/bird place/year) ^{1,2}		Ammonia emissions (kt/year)
Duck Farms with 24,000 – 40,000 birds	35	1,166,123	Ducks - Litter	0.11	0.128
Totals	254	7,569,384			1.743

- 1) IPPC Application Form, Annex 1.
- 2) Emissions factors weighted based on data from the UK ammonia emissions inventory & projections (IGER, version 3rd October 2007).

Table 4.5 Estimation of BAU ammonia emissions from affected poultry installations (litter/manure storage)

Category	Typical volumes of excreta produced (kg/day)	No. bird places	Total volume produced (tonnes/year)	Ammonia emission factor (kg/tonne fresh manure) ^{1,2}	Ammonia emissions (kt/year)
1000 laying hens	115	1,645,997	69,091	2.38	0.16
1000 laying hens (air dried)	49	2,057,497	36,798	2.38	0.09
1000 male turkeys & litter	159	1,349,884	78,340	1.74	0.14
1000 female turkeys & litter	74	1,349,884	36,460	1.74	0.06
1000 ducks	290	1,166,123	123,434	1.74	0.21

Table 4.8 (continued) Estimation of BAU ammonia emissions from affected poultry installations (litter/manure storage)

Category	Typical volumes of excreta produced (kg/day)	No. bird places	Total volume produced (tonnes/year)	Ammonia emission factor (kg/tonne fresh manure) ^{1,2}	Ammonia emissions (kt/year)
Totals		7,569,384	344,124		0.67

- 1) IPPC Application Form, Annex 1.
- 2) Emissions factors weighted based on data from the UK ammonia emissions inventory & projections (IGER, version 3rd October 2007).

Table 4.6 Estimation of BAU ammonia emissions from affected poultry installations (landspreading of manure on operator controlled land)

	Exported	Spread on-site	Ammonia emission factor (kg/tonne fresh manure) ¹	Ammonia emissions from on-site spreading (kt/year)	Assumptions
%	69%	31%			Split taken from figures presented in Defra, 2006 for poultry installations currently included under IPPC
Layers (t/year)	73,063	32,826	6.12	0.20	Assuming currently spread by broadcast (but not ploughed in within 24 hours)
Other poultry (t/year)	164,382	73,853	9.18	0.68	Assuming currently spread by broadcast (but not ploughed in within 24 hours)
Totals	237,446	106,678		0.88	

1) IPPC Application Form, Annex 1.

Total ammonia emissions from agriculture and poultry installations in 2006 were approximately 263kt and 38kt, respectively¹⁸. Based on the GB Poultry Register data and emission factors from EA guidance, total emissions of ammonia from GB poultry farms likely to be affected by the change in threshold is calculated to be **3.29 kt per year**. This equates to approximately 1.25% and 8.7% of total agricultural and poultry ammonia emissions in 2006, respectively (rising to 1.3% and 11.2% in 2015).

Dust emissions

Table 4.7 below provides estimations of dust emissions based on the methodology and assumptions described above.

Table 4.7 Estimation of BAU dust emissions from affected poultry installations

Category	No premises	No bird places	Dust emission factor (kg/bird place/year) ¹	Dust (kt)	
Turkey Farms with 11,500 – 40,000 birds	114	2,699,767	Male Turkeys – Litter	0.9	
			Female Turkeys - Litter	0.5	
			Weighted	0.7	
				1.890	
Chicken Layer farms with 30,000 – 40,000 birds	105	3,703,494	Layer	0.3	1.111
Duck Farms with 24,000 – 40,000 birds	35	1,166,123	Ducks - Litter	0.2	0.233
Totals	254	7,569,384			3.234

1) IPPC Application Form, Annex 1.

¹⁸ UK ammonia emissions inventory & projections (IGER, version 3rd October 2007).

4.2.2 Manure Spreading

Ammonia emissions

The ammonia emissions associated with manure and slurry that is currently exported from IPPC installations and spread off-site have been estimated based on the assumptions and methodology described in Section 4.1.2. As described previously a low and high scenario has been established to reflect the uncertainty in the techniques that are applied. The low scenario assumes that any exported manure or slurry produced in an NVZ is spread according to BAT whereas the high scenario assumes that all exported manure and slurry (excluding that sent to power stations for combustion) is not currently spread according to BAT.

Table 4.8 Overview of BAU ammonia emissions from spreading of exported manure and slurry

	Ammonia emission factor (kg/m ³ or kg/tonne) ¹	Spread on grassland (m ³ or tonne/year)	Ammonia emissions (kt/year)	Spread on arable land (m ³ or tonne/year)	Ammonia emissions (kt per year)	Assumptions
Pig Slurries	0.95	51,096-304,384	0.05-0.29	51,096-304,384	0.05-0.29	Assuming currently broadcast (without rapid incorporation)
Pig Manures	1.01	4,656-20,574	0.005-0.02	41,901-185,168	0.04-0.19	
Layer & 'non' broiler manures	6.12	38,019-123,000	0.23-0.75	342,171-1,107,002	2.09-6.77	
Broiler manures	9.18	34,498-111,925	0.32-1.03	310,483-1,007,329	2.85-9.25	
Totals			0.60-2.09		5.04-16.50	
					5.64-18.59	

1) IPPC Application Form, Annex 1.

Total ammonia emissions from agriculture and manure spreading in 2006 were approximately 263kt and 75kt, respectively¹⁸. Based on the assumptions and data inputs outlined in previous sections, total emissions of ammonia from manure and slurry spreading that is likely to be affected by the proposed changes to the Directive is calculated to be **5.6-18.6 kt per year**. This equates to approximately 2.2-7.1% and 7.5-24.8% of total agricultural and manure spreading ammonia emissions in 2006, respectively (rising to 2.3-7.6% and 9-29.5% in 2015).

4.3 Overview of current legislation

4.3.1 Poultry installations

IPPC requirements

Currently, an IPPC permit is required for intensive livestock installations with more than 40,000 places for poultry. The permit covers all aspects of farm management from feed delivery to manure spreading but does not deal with animal welfare. Animal welfare standards must be built into the design and operation of the farm.

In order to secure a permit, it is necessary to complete an application form and supporting documentation such as: application site report, site plans and assessment of environmental impacts, and may also include an odour or noise management plan.

The Standard Farming Permit presents a number of standard conditions that need to be met, together with other site-specific conditions. These include topic areas such as:

- Management (general; accidents; energy; raw materials; waste and security);
- Operations (closure and decommissioning; site protection and monitoring programme; livestock numbers and movements);
- Emissions and monitoring (to water, air or land; to groundwater; diffuse emissions; odour; noise and vibration);
- Information (records; reporting; notifications);
- Poultry Specific (feed; housing; slurry and manure).

There is a requirement to demonstrate that no significant pollution is caused by presenting an assessment of the environmental impact of emissions from the activities as a whole. The IPPC Technical Guidance Note for Intensive Farming provides a screening tool that gives an initial assessment of environmental impacts, and identifying whether further detailed investigation is or is not necessary. This includes a 6-step process to assess the impacts of an installation on the environment:

- Step 1: Identify the sources of emissions and activities that impact on the environment;
- Step 2: Identify the emission;
- Step 3: Identify the receptors;
- Step 4: Describe the negative impact and duration;
- Step 5: Identify the significance of the impacts;
- Step 6: Identify the mitigation or management measures that you will have in place to reduce the impacts.

Sites that fall outside the threshold for IPPC permits are not subject to the same regulation under the EA. However, other regulations cover many similar requirements as the permit conditions. Table 4.9 summarises and compares the requirements of the IPPC permit and other regulations giving an indication of the additional work that may need to be conducted under the proposed changes.

Table 4.9 Summary and Comparison of Poultry Farm Requirements

Topic Area	Summary Interpretation of PPC Requirement	Requirements for those installations falling outside the PPC Threshold
Management		
General Management	<p>1.1.1: Activities to be managed and operated in accordance with a management system which identifies and minimises risks of pollution, and by competent persons.</p> <p>1.1.2: Records to demonstrate 1.1.1 to be maintained.</p> <p>1.1.3: Easy access to permit duties to be provided for personnel.</p>	
Accidents	1.2.1: Accident management plan.	
Energy Efficiency	1.3.1: Take measures to ensure energy efficiency.	(Voluntary commitment to Climate Change Levy Agreement enables farms to achieve reduced rate relief.)
Use of Raw Materials	1.4.1: Take measures to ensure raw materials and water are used efficiently.	If abstraction of more than 20m ³ of water per day from ground or surface waters, require a Water Use & Abstraction License from the EA.
Wastes	1.5.1: Maintain records of waste produced and sent off site and take appropriate measures to ensure waste produced is avoided or reduced.	<p>Duty of Care – Waste responsibilities</p> <p>Hazardous Waste regulations, on disposal of e.g. fluorescent tubes, pesticides, oily sludge, lead-acid batteries, health care waste.</p>

Table 4.13 (continued) Summary and Comparison of Poultry Farm Requirements

Topic Area	Summary Interpretation of PPC Requirement	Requirements for those installations falling outside the PPC Threshold
Site Security	1.6.1: Prevention of unauthorised access to site.	(Potential bio-security regime)
Operations		
Closure & Decommissioning	2.1.1 – 2.1.4: Prevention or minimisation of activities that create pollution risk on closure/decommissioning, and maintenance of site closure plan.	
Site Protection & Monitoring	2.2.1 – 2.2.2: Submission, implementation and maintenance of site protection and monitoring programme.	
Livestock Numbers & Movements	2.3.1: A system to record the number of animal places and movements.	For sites with >50 birds, registration on the GB Poultry Register.
Emissions & Monitoring		
Water, air or land	3.1.1 - 3.1.4: Point source discharges to water, air or land to not cause pollution, unless the operator has used appropriate measures, including those specified in the permit, to prevent or where that is not practicable, to minimise, those emissions. No point source emissions except from those listed in permit. Limits not to be exceeded.	Discharge to sewer requires a trade effluent consent (or entry to a Trade Effluent Agreement) with the statutory sewerage undertaker (i.e. water company).

Table 4.13 (continued) Summary and Comparison of Poultry Farm Requirements

Topic Area	Summary Interpretation of PPC Requirement	Requirements for those installations falling outside the PPC Threshold
Groundwater	<p>3.2.1: No emission from activities into groundwater of any substance in List I (in Groundwater Regs).</p> <p>3.2.2: No emission from activities into groundwater of any substance in List II (in Groundwater Regs) so as to cause pollution.</p>	<p>Discharge of sewerage, effluent or contaminated run-off to surface or ground waters requires authorisation from the EA in the form of a discharge consent or other appropriate authorisation.</p>
Diffuse Emissions	<p>3.3.1: Diffuse emissions of substances (not noise or odour) not to cause pollution unless appropriate measures have been used to minimise.</p> <p>3.3.2: All liquids, whose emission to water or land could cause pollution, shall be provided with secondary containment, unless the operator has used other appropriate measures to prevent of where that is not practicable, to minimise, leakage and spillage from the primary container.</p> <p>3.3.3: A review of all site drainage shall be undertaken and submitted within 12 months of the issue of the permit. Improvements to drainage systems shall be implemented in accordance with a timetable agreed with the EA.</p>	

Table 4.13 (continued) Summary and Comparison of Poultry Farm Requirements

Topic Area	Summary Interpretation of PPC Requirement	Requirements for those installations falling outside the PPC Threshold
Odour	3.4.1 – 3.4.2: Prevention or minimisation of annoyance from odour.	Statutory Nuisance – local council have the authority to limit or stop activities if they are causing a nuisance.
Noise & Vibration	3.5.1 – 3.5.2: Prevention or minimisation of annoyance from noise and/or vibration.	Statutory Nuisance – local council have the authority to limit or stop activities if they are causing a nuisance.
Monitoring	3.6.1 – 3.6.3: Monitoring of parameters set out in permit, maintaining records and submitting data to EA.	
Information		
Records	4.1.1 – 4.1.3: Provision of records to EA in legible manner.	
Reporting	4.2.1 – 4.2.3: Reporting to the EA in accordance with permit requirements and EA requests.	
Notifications	4.3.1 – 4.3.6: Notifications to the EA.	
Poultry Production		
Feed	6.1.1: Provision of feed to minimise excretion of nitrogen and phosphorous.	

Table 4.13 (continued) Summary and Comparison of Poultry Farm Requirements

Topic Area	Summary Interpretation of PPC Requirement	Requirements for those installations falling outside the PPC Threshold
Housing	<p>6.2.1.1: Design and management of housing to minimise emissions.</p> <p>6.2.2.1: Review of existing housing and management practices to reduce emissions.</p>	
Slurry & Manure	<p>6.3.1.1: Design, construction and operation of slurry storage systems to prevent or minimise emissions.</p> <p>6.3.1.2: Replacement/covering of existing uncovered slurry stores and lagoons.</p> <p>6.3.2.1: Design, construction and operation of manure storage systems to prevent or minimise emissions.</p> <p>6.3.2.2 – 6.3.2.3: Installation of impermeable base with effluent containment for manure stores.</p>	<p>Notification to EA must be provided on installation of new storage facilities and design/maintenance follow certain requirements such as capacity requirement or a waste (manure) management plan etc.</p>

4.3.2 Manure spreading

Requirements for Farms with IPPC Permits

With regards to IPPC installations, requirements include demonstration that the best use is being made of slurries and manure produced on the farm and that pollution risks are being minimized. This is achieved through preparation of and following a Manure Management Plan. An acceptable plan assesses and minimises the risks of pollution of ground and surface water from land-spreading, and accounts for all other manure, litter, slurry or organic materials to be spread on the land to which it applies.

The Guidance for Operators on Manure Management Planning for IPPC installations provides a nine step plan:

- Step 1: Calculate manure and 'liquid' waste production;
- Step 2: Calculate quantities of manures, effluents, and liquid wastes imported;
- Step 3: Calculate total manure, effluent and liquid waste that will be spread under this plan, considering both nutrients and volume;
- Step 4: Identify manure spreading area;
- Step 5: Produce a map of manure spreading areas;
- Step 6: Calculate minimum areas of land required for land spreading. (Taking into account how much land is required to comply with limits (N, NVZ whole farm and field limits, volume limits in Water Code) and comparing the land required with the land identified in Step 4 as being available.);
- Step 7: Planning where to spread. (Taking into account areas where no spreading should take place, maximum annual applications, and using lower, high and very high areas – as will be required under the Nitrates Action Programme requirements in areas designated as NVZs.);
- Step 8: Application methods. (Taking in account solid manure, slurry, and use of contractors, with regard to the Nitrates Action Programme requirements in areas designated as NVZs.); and
- Step 9: Contingency planning.

Many of the figures and allowances used in the guidance for manure management planning are drawn from the Code of Good Agricultural Practices for the Protection of Water (Water Code), and the plan should show that the manure would be spread in accordance with the requirements in this code/guidance.

Requirements outside of IPPC Permitting

Outside of the IPPC requirements, farmers (and contractors) must not let slurry or manure enter rivers, streams, burns and other watercourses. If polluting effluent is allowed to enter surface waters or groundwater it may be considered a pollution offence. The Defra water pollution guidance (Water Code) applies if:

- There is discharge or potential to discharge anything into surface waters or groundwater; and
- There is a chance that substances from the site could enter surface waters or groundwater accidentally, for example by spillage or run-off.

In addition if the farm is within a Nitrate Vulnerable Zone (NVZ), there is a requirement to comply with NVZ action programme rules (which includes aspects regarding records and spreading).

Most farmers receive payments under the Common Agricultural Policy's (CAP) Single Payment Scheme, where their land is registered as eligible. Virtually all agricultural land is now registered. Receipt of payments is, however, conditional on achieving and maintaining certain standards (known as 'cross compliance'). There are two key elements to cross compliance:

- Statutory Management Requirements (SMRs): these are existing legal requirements that cover the environment, public health, plant health, and animal health and welfare; and
- Standards that keep land in Good Agricultural and Environmental Condition (GAEC), including habitat conservation and soil management and protection standards.

It should be noted that intensive livestock units may not have much land, and so payments may be fairly small. However, pig and poultry manure is highly likely to be applied to land registered under the scheme and so will be subject to cross-compliance.

In order to meet the cross compliance rules of the single payment scheme, farms must comply with the NVZ action programme.

Nitrates Directive

The Nitrates Directive was adopted in Europe in 1991 and is an environmental measure designed to reduce water pollution by nitrate from agricultural sources and to prevent such pollution occurring in the future. The Directive requires Member States to:

- Designate as Nitrate Vulnerable Zones (NVZs) all land draining to waters that are affected by nitrate pollution;

- Establish a voluntary code of good agricultural practice to be followed by all farmers throughout the country;
- Establish an Action Programme of measures for the purposes of tackling nitrate loss from agriculture; and
- Review the extent of their NVZs and the effectiveness of their Action Programmes at least every four years and to make amendments if necessary.

In compliance with this last point, Defra is reviewing the extent of NVZs and the operation of the Action Programme operating in England (as are the Scottish Executive, Dept. for Agriculture and Rural Development Northern Ireland and National Assembly for Wales in other parts of UK). The options under consideration in England include extending the area designated as NVZ from the current 55% to 70% or the whole country. In addition, the management measures that apply within NVZs are being revised and measures are being considered affecting:

- maximum levels of nitrogen from organic sources at whole farm and field level;
- provision of minimum storage capacity;
- when manure is spread;
- the techniques with which manure can be spread (some methods, such as rain guns, will be prohibited);
- the need for manures to be incorporated in the soil within 24 hours of spreading, in some circumstances;
- risk assessments which highlight where manure spreading carries an unacceptable risk of pollution; and
- the recording of how decisions were made and what was done.

The main intention of the above measures is to minimise or prevent contamination of the water environment with nitrates. However, many of these requirements will also constitute BAT for prevention of emissions to air, although some differences may arise (for example, incorporation of some sorts of manures into soil within 6 hours is needed to minimise emissions of ammonia to air). Nonetheless, it is logical to ensure that the requirements for both NVZ and IPPC share as much in common as possible.

It is also noted that when adapting farming practices to the proposed Action Programme measures, farmers will have to continue to respect any management agreements they have entered into (e.g. under Environmental Stewardship) and other legal obligations, such as the need to apply to Natural England for an Environmental Impact Assessment (EIA) screening decision before spreading slurry on uncultivated land or semi-natural areas.

Overview of Requirements

All farms must adhere to requirements surrounding potential water pollution from manure spreading. Those with IPPC Permits must provide a 'plan', for which guidance is given, and are likely to be scrutinised more closely; however, as all farms are assessed by essentially the same legislation, the additional work required by farms with IPPC Permits is largely one of management and administration.

It was reported in the Defra Cumulative Impact Analysis¹⁹ that the main costs to agriculture from compliance with the IPPC Directive arise from modifying animal housing to reduce emissions and improve slurry management and additional processes required to apply manure and slurry to land.

According to the Farm Practices Survey, 2004²⁰ (Defra), 47% of farms have manure management plans, compared with 20% in 2001.

4.4 Summary

4.4.1 Poultry Installations

Based on the GB Poultry Register, data provided by DARDNI and emission factors from EA guidance, total emissions of ammonia from UK poultry farms likely to be affected by the change in threshold is calculated to be **3.29 kt per year**. The BPC have noted that the numbers of farms likely to be affected by the change in threshold if it were to come into force by 2015 is unlikely to change significantly from the current situation. Therefore, for the baseline we have assumed that the number of premises and bird places detailed in Table 4.1 (and associated manure production) and associated emissions (Table 4.4, Table 4.5 and Table 4.6) will remain constant over the timescales of interest for this study (2015, 2020 and 2025). In fact there may be a slight decline in numbers of smaller poultry installations as there is a generally increasing trend for fewer installations with a greater number of places.

4.4.2 Manure Spreading

Based on the assumptions and data inputs outlined in previous sections, total emissions of ammonia from manure and slurry spreading that is likely to be affected by the proposed changes to the Directive is calculated to be **5.6-18.6 kt per year**. Although total ammonia

¹⁹ See: <http://www.defra.gov.uk/farm/policy/regulation/charge/pdf/cumulative-burdens.pdf>

²⁰ See: <http://statistics.defra.gov.uk/esg/publications/fps/fpsreport.pdf>

emissions from all manure spreading activity is projected to decline under BAU it is assumed that there would be no incentive for non-IPPC operators to spread according to BAT without any further regulation (except where affected by NVZ regulations). Therefore, it has been assumed that the estimated volume of manure and associated emissions that may be affected by the proposed changes will remain constant over the relevant timescales.

One factor that may be of concern is the current financial crisis facing pig farmers. Contemporary reports suggest that many pig farmers are operating at a financial loss and cannot sustain their businesses. The net effect of the additional costs of further regulation could be that more farmers will leave the industry than would otherwise be the case. As a consequence, the number of affected farmers will probably decline.

5. Costs

5.1 Approach

5.1.1 Poultry Installations

Compliance costs

Compliance costs for the poultry installations that may be affected by the proposed changes to the threshold have been estimated based on discussions with relevant stakeholders (for example, NFU) and published information on the potential measures that may be required and their associated costs. From discussions with the EA, the compliance costs for up to about 10% of the intensive livestock installations currently subject to the Directive may be further increased by additional measures needed to protect contiguous “Habitats Directive” sites, but the extent of those increases was not clear at the time this report had to be finalised. Therefore, within the timescales of this study it has not been possible to identify how many of the estimated 254 installations which would become subject to IPPC would be affected in this way.

The most recent review of the potential measures that IPPC installations may need to implement in order to comply with the Directive is presented in Defra, 2006¹⁵. This looked at all aspects of compliance for both poultry and pig installations from housing improvements to changes in the way manure is managed. The measures assumed in the report and their associated capital and operating costs have been applied to estimate total compliance costs for the affected installations (excluding permit application and subsistence costs which have been estimated based on additional information). The costs from the report have been uplifted to 2008 prices and updated, where necessary, in discussions with Natural England²¹. The assumed measures and their unit costs (per installation, bird place or unit of manure) are summarised in Section 5.2.1 as well as the total capital and annual costs.

Costs have been annualised over a 20 year lifetime of the installation (in line with Defra, 2006) with a discount rate of 3.5%. It is assumed that all of the costs would be incurred by ‘small’ or ‘medium’ sized businesses as defined by the Farm Business Survey (i.e. 1-3 full time equivalents)²².

²¹ Personal communication with Martin Ryan, Natural England, March 2008.

²² The Farm Business Survey measures farm size based on Standard Labour Requirements (SLRs). The SLR for a farm business represents the labour requirement (in full-time equivalents) for all the agricultural activities on the

Administrative costs

Operators

Administrative costs for operators can be broken down into two main elements each of which can be further sub-divided:

- Permit application (one-off):
 - permit application fees (currently £3,441 for a standard farming permit in England & Wales)^{23,24};
 - farmer's time to prepare the permit and all of the supporting information required (varies depending upon whether or not farmer uses consultants to prepare the application – assumed to vary between £300 and £4,000²⁵).
- Subsistence costs (annual):
 - subsistence charge (currently £2,303 for a small standard farm in England & Wales)^{23,24};
 - farmer's time for record keeping, inventory preparation, staff training and inspections (assumed to cost between £1,600 and £2,300 based on estimates from Defra, 2006 and the Commission's IA).

One-off costs have been annualised over the lifetime of a permit (assumed to be 20 years in line with Defra, 2006) with a discount rate of 3.5%.

farm, based on standard coefficients for each commodity on the farm. The SLR is representative of labour requirement under typical conditions for enterprises of average size and performance.

²³ IPPC Pigs and Poultry Annex 1 – 2007/08. Supplementary information on emission factors and charges for Form IPPC 2 Application for a Pig and Poultry Rearing Permit. Available from: http://www.environment-agency.gov.uk/commondata/acrobat/annex_1_ippc_1012521.pdf

²⁴ Permit application and subsistence fees vary in Scotland and Northern Ireland. For example, in Northern Ireland the application fee varies between £1,918-2,733 with additional fees if land spreading takes place (£336-672). Subsistence fees vary between £1,030-2,130 with an additional £220-545 with land spreading. However, for the purposes of this study the fees applicable in England and Wales have been applied to estimate administrative burden for all operators. Overall, the variation in fees is minimal and will therefore have a relatively negligible impact on total administrative costs.

²⁵ Based on estimates of time and consultant's fees provided by the NFU (personal communication from Diane Mitchell, NFU, March 2008):

- £300 based on a farmer spending 3 days preparing their permit using the Standard Cost Model (SCM) wage rate of £13.50 for a farm manager (2008 prices).
- £4,000 assumes that consultants have been employed to prepare the application.

Regulators

For some IPPC sectors it could be assumed that the permit fees and subsistence charges paid by operators would be sufficient to cover regulators' costs for the processing of the permit and ongoing enforcement. However, the EA have undertaken an audit of the actual costs incurred in processing IPPC permits for agriculture installations and have indicated that their processing costs have actually been approximately 70% higher than the permit fee itself. This has been due to a number of reasons including the fact that detailed ammonia dispersion modelling has been undertaken. Therefore, a one-off administrative cost has been calculated based on the 70% estimate described above (approximately £2,400 per installation). It is assumed that the subsistence fee paid by operators should be sufficient to cover any ongoing costs.

5.1.2 Manure Spreading

Compliance costs

Compliance costs for the application of BAT to manure and slurry spreading off-site has been estimated following the approach outlined for poultry installations. The required BAT measures for spreading and their associated unit costs have been taken from Defra, 2006 and updated in consultation with Natural England, where necessary. These costs have been combined with the manure volumes presented in Table 4.2 and Table 4.3 to estimate the range of potential compliance costs for the low and high scenarios. These costs would be incurred by the non-IPPC farms currently receiving and spreading manure/slurry.

Costs have been annualised over a 20 year lifetime (in line with Defra, 2006) with a discount rate of 3.5%. A range of different sized installations are likely to be affected by the proposed changes for manure spreading. For the purposes of this study, it is assumed that the costs would be incurred by small and medium sized organisations²².

Administrative costs

Operators

As all of the installations currently exporting manure/slurry are already included under IPPC it has been assumed that they would only need to apply for a variation to their existing permit rather than a completely new permit. A variation to a standard farming permit currently costs £350 (2007/08 charges). In addition to the variation charge, there also is the cost of the farmer's time which has been broken down as follows:

- initial time to prepare an application for a variation including the development of a manure management plan (estimated to take a farmer 1-2 days at a cost of £100-200 using the SCM wage rates for a 'farm manager');

- annual cost of record keeping, inventory preparation, staff training and inspections (estimated to take a similar amount of time as the initial application for a variation, £100-200).

There may also be some administrative costs for those farms receiving and spreading manure/slurry (for example, record keeping to demonstrate that BAT have been applied) although this has not been included at this stage because of uncertainties relating to the way in which it could be implemented and regulated (see below).

One-off costs have been annualised over the lifetime of a permit (assumed to be 20 years in line with Defra, 2006) with a discount rate of 3.5%.

Regulators

At present it is unclear exactly how the requirement for BAT for off-site spreading could be regulated within the current framework. The proposed change to the Directive states that Member States can include the requirements in measures other than a permit if appropriate. One possible way to implement and regulate the change would be for operators to be required to develop new and/or extend existing manure management plans which would need to cover both on-site and off-site spreading. The operator would need assurances from any third parties taking manure and/slurry that it is being spread according to BAT. Given that the importer has alternative options to get manure from elsewhere the onus is going to be on the exporter to undertake any administrative burdens. The regulatory authorities could then check this as part of their compliance monitoring activities.

At this stage it has been assumed that the regulatory authorities would not incur any additional costs that are not already covered by the variation fee described above and existing subsistence fees under IPPC. In some instances there could be cost savings from having a specialised monitoring team given more requirements for compliance reporting under various other regulations such as NVZ compliance and cross-compliance.

5.2 **Results**

5.2.1 **Poultry Installations**

Compliance costs

The compliance costs likely to be incurred by operators of the additional poultry installations that would be included under IPPC are presented in Table 5.1. These are broken down into capital (one-off) and annual costs. The key assumptions in terms of measures assumed, proportion and numbers of bird places affected etc. are also included in the table. As highlighted in

Section 5.1.1, the measures assumed and their associated costs have been taken from Defra, 2006 and updated, where necessary.

Total compliance costs are estimated to be approximately £1.9 million per year for those installations likely to be included under IPPC with the proposed changes to the poultry threshold (made up of a one-off capital cost of approximately £4.2 million and annual costs of approximately £1.6 million). This gives an average cost of approximately £7,500 per farm per year. This compares favourably with the Commission's analysis which estimated compliance costs to be approximately €11,110 (£8,400) per farm (based on total compliance costs of approximately €10 million (£7.7 million) for around 900 farms).

Table 5.1 Compliance costs (poultry installations)

Cost Element	Units	Number/ volume	Proportion affected (%)	Capital cost (£/unit)	Annual cost (£/unit)	Total capital cost (£)	Total annual cost (£)	Key assumptions (based on Defra, 2006)
Bunding fuel stores (cost of providing bunding plus annual charge)	installa tion	254	100%	£3,278.13	£465.49	£832,644	£118,235	Assuming 1 store per installation
Additional insulation of roof % walls to reduce condensation & maintain a dry friable litter (plus annual charge for insulation sheets)	bird place (layers)	293,928	15%	£1.80	£0.25	£79,491	£11,081	Non-cage systems for adult laying birds. Additional insulation required for 15% of accommodation
	bird place (ducks & turkeys)	3,865,89 0	5%	£1.15	£0.16	£221,775	£31,682	Non-cage systems for ducks & turkeys. Additional insulation required for 5% of accommodation
Manure drying for existing deep pit systems (fans & equipment plus annual charge)	bird place	1,352,06 9	50%	£0.11	£0.02	£73,871	£14,774	Manure drying applied to 50% of cage systems for laying hens.

Table 5.1 (continued) Compliance costs (poultry installations)

Cost Element	Units	Number/ volume	Proportion affected (%)	Capital cost (£/unit)	Annual cost (£/unit)	Total capital cost (£)	Total annual cost (£)	Key assumptions (based on Defra, 2006)
Air drying for manure belts for cage systems (under cage duct plus annual costs)	bird place	2,057,497	90%	£1.09	£0.50	£2,023,419	£930,773	Assuming 90% of cage systems with manure belts for layers do not currently have air drying.
Swales for dust removal from roof water of poultry houses	bird place	7,569,384	50%	£0.25	£0.03	£951,180	£124,067	Assuming ~50% of housing for layers, turkeys & ducks have baffled roof ventilation systems & require a swale or soak-away with associated drainage to remove dust.
Feeding								IPPC rules already BAU in the majority of installations, whether governed by them or not, so no additional compliance costs anticipated.
Manure storage (covering with plastic sheet)	tonne manure	344,124	100%		£0.49		£169,212	Total manure estimated based on bird places that would be affected by the change in threshold & standard excreta production

Table 5.1 (continued) Compliance costs (poultry installations)

Cost Element	Units	Number/ volume	Proportion affected (%)	Capital cost (£/unit)	Annual cost (£/unit)	Total capital cost (£)	Total annual cost (£)	Key assumptions (based on Defra, 2006)
Manure spreading (low emission technique - rapid incorporation by discs)	tonne manur e	344,124	28%		£2.17		£209,090	factors. Includes annual cost of sheet & labour. Assumed that 69% of poultry manure is currently exported. 90% of remainder is spread on arable land & 10% on grassland. Assumed no capital cost as discs are a standard item of equipment. Assumed no low emission techniques for application of manure to grassland.
Total						£4,182,381	£1,608,914	

Administrative costs

The administrative costs associated with the proposed change to the poultry threshold are summarised in the table below.

Table 5.2 Administrative costs (poultry installations)

Cost element	Unit cost (£/installation)	One-off costs (£)	Annual costs (£/year)
Operators			
Permit application fees	£3,441	£874,014	-
Permit application time costs	£304-4,000	£77,186-1,016,000	-
Subsistence fees	£2,303	-	£584,962
Subsistence time costs	£1,606-£2,300	-	£407,995-584,200
<i>Sub-Total</i>		<i>£951,200-1,890,014</i>	<i>£992,957-1,169,162</i>
Regulatory Authorities			
Permit application time costs (regulators)	£2,409	£611,810	-
Subsistence time costs	Assumed to be covered by subsistence fee paid by operator	-	-
<i>Sub-Total</i>		<i>£611,810</i>	<i>-</i>
Total Administrative Costs		£1,563,010-2,501,824	£992,957-1,169,162

The annualised administrative costs (equivalent annual cost of one-off costs plus annual costs) for operators are estimated to be approximately £1.1-1.3 million per year and for the regulatory authorities approximately £43k per year. This gives an annual administrative cost (for operators and regulatory authorities) of approximately £4.3-5.3k per installation per year.

5.2.2 Manure Spreading

Compliance costs

The compliance costs likely to be incurred by the application of BAT to manure spreading off-site are presented in Table 5.3 for the low (i.e. assuming that some exported manure/slurry is spread in NVZs and according to BAT) and high (i.e. assuming all exported manure is currently not spread according to BAT) scenarios (see Section 4.1.2 for further details of the assumptions behind the two scenarios). The key assumptions in terms of measures assumed, proportion and volume of manure affected etc. are also included in the table. As highlighted in Section 5.1.2, the measures assumed and their associated costs have been taken from Defra, 2006 and updated, where necessary.

Table 5.3 Compliance costs (off-site manure spreading)

		Unit	Total annual production	Currently exported	Spread on grassland	Spread on arable land	Key assumptions (based on Defra, 2006)	
Pig Slurries	Volume	m ³ /tonne	1,994,412	England: 25% NI: 83%	608,767	51,096-304,384	51,096-304,384	50% spread on arable land & 50% spread on grassland
	Unit cost of low emission technique	£/m ³				£1.79	£0.84	Low emission technique for slurry assumed to be by trailing hose for grassland & rapid incorporation by discs on arable land.
	Total cost	£				£91,566-545,468	£43,140-256,991	
Pig Manures	Volume	tonne	705,884	England: 29% NI: 83%	206,081	4,656-20,574	41,901-185,168	90% spread on arable land & 10% spread on grassland
	Unit cost of low emission technique	£/tonne				£0.00	£1.18	Low emission technique is rapid incorporation by discs on arable land. No low emission techniques for manure applied to grassland.
	Total cost	£				£0.00	£49,443-218,498	

Table 5.5 (continued) Compliance costs (off-site manure spreading)

		Unit	Total annual production	Currently exported	Spread on grassland	Spread on arable land	Key assumptions (based on Defra, 2006)	
Layer & 'non' broiler manures	Volume	tonne	2,253,930	England: 69% NI: 97%	1,230,003	38,019-123,000	342,171-1,107,002	90% spread on arable land & 10% spread on grassland. Assumed 335,000 tonnes sent to power stations for combustion (50% of total amount).
	Unit cost of low emission technique	£/tonne				£0.00	£2.17	Low emission technique is rapid incorporation by discs on arable land. No low emission techniques for manure applied to grassland.
	Total cost	£				£0.00	£742,512-2,402,195	
Broiler manures	Volume	tonne	2,093,426	England: 69% NI: 97%	1,119,255	34,498-111,925	310,483-1,007,329	90% spread on arable land & 10% spread on grassland. Assumed 335,000 tonnes sent to power stations for combustion (50% of total amount).
	Unit cost of low emission technique	£/tonne				£0.00	£4.05	Low emission technique is rapid incorporation by discs on arable land. No low emission techniques for manure applied to grassland.
	Total cost	£				£0.00	£1,257,458-4,079,684	

Table 5.5 (continued) Compliance costs (off-site manure spreading)

	Unit	Total annual production	Currently exported	Spread on grassland	Spread on arable land	Key assumptions (based on Defra, 2006)
Total annual cost				£91,566-545,468	£2,092,553-6,957,367	
					£2,184,119	
					-7,502,835	

Total compliance costs are estimated to be approximately £2.2-7.5 million per year (£2.5-8.5 million per year if scaled to include potential impacts in Scotland and Wales - see Section 4.1.2 for details of approach to scaling). These costs would be incurred by the non-IPPC farms currently receiving and spreading manure/slurry as they would have to spread according to BAT. This gives an average cost of approximately £3.9-13.2k per farm per year (based on the assumption that just over 550 farms are currently exporting manure/slurry and each farm only exports to a single non-IPPC farm). In reality the costs are likely to be lower as many farms will be complying closer to BAT requirements. For example rapid incorporation by discs on arable land could be BAU if the installation is in a NVZ (based on proposed changes to the NVZ regulations in England although spreading requirements may vary for each country).

The costs per farm may also be much lower if an IPPC farm exports manure/slurry to more than one non-IPPC farm. The additional costs for land spreading on non-IPPC sites may lead to a reduction in demand for manure/slurry which could result in the producing farms having to spread greater amounts on-site rather than exporting. If this were the case then the compliance costs presented above would be incurred by existing IPPC installations. This problem can be compounded if the installation is in an NVZ as they will have to store this manure during closed periods, usually at great cost. The only alternative would be for farmers to reduce stock numbers, which again can be expensive.

The Commission's IA presents total compliance costs for the EU of approximately £92-110 million based on a 50-60kt reduction in ammonia emissions and an average cost of reducing ammonia around €2,400 per tonne (~£1,800). Costs per farm have not been calculated and/or presented in the Commission's IA.

Administrative costs

The administrative costs associated with the application of BAT to manure spreading off-site based on the assumptions outlined in Section 5.1.2 are summarised in the table below.

Table 5.4 Administrative costs (manure spreading)¹

Cost element	Unit cost (£/installation)	One-off costs (£)	Annual costs (£/year)
Operators			
Permit variation fees	£350	£198,783	-
Permit variation time costs	£101-203	£57,530-115,060	-

Table 5.8 (continued) Administrative costs (manure spreading)¹

Cost element	Unit cost (£/installation)	One-off costs (£)	Annual costs (£/year)
Subsistence fees	Assuming no change to existing situation	-	-
Subsistence time costs	£101-203	-	£57,530-115,060
<i>Sub-Total</i>		<i>£256,313-313,843</i>	<i>£57,530-115,060</i>
Regulatory Authorities			
Processing variation application	Assuming costs covered by variation fee	-	-
Annual subsistence costs	Assuming costs covered by existing subsistence fees paid by operator	-	-
<i>Sub-Total</i>		-	-
Total Administrative Costs		£256,313-313,843	£57,530-115,060

Note 1: Assuming approximately 568 installations may be affected by the proposed changes.

The annualised administrative costs (equivalent annual cost of one-off costs plus annual costs) for operators are estimated to be approximately £75-137k per year (£83-152k per year if scaled to include potential impacts in Scotland and Wales - see Section 4.1.2 for details of approach to scaling). This gives an annual administrative cost of approximately £140-240 per installation per year. However, it is important to note that at this stage it is unclear exactly how this proposed change would be implemented and enforced. Therefore, the costs presented may be underestimated if operators (IPPC and non-IPPC farms) and/or the regulatory authorities have to take any further actions to ensure compliance beyond those highlighted in Section 5.1.2.

5.3 Summary

5.3.1 Poultry installations

Total **compliance costs** are estimated to be approximately **£1.9 million per year** for those installations likely to be included under IPPC with the proposed changes to the poultry threshold (made up of a one-off capital cost of approximately £4.2 million and annual costs of approximately £1.6 million). This gives an average cost of approximately **£7,500 per installation per year**. This compares favourably with the Commission's analysis which estimated compliance costs to be approximately €11,110 (£8,400) per farm (based on total compliance costs of approximately €10 million (£7.7 million) for around 900 farms).

Total annualised **administrative costs** are estimated to be approximately **£1.1-1.3 million per year (for operators)** and approximately **£43k per year (for the regulatory authorities)**. This gives a total annual administrative cost (for operators of installations brought under IPPC regulation and regulatory authorities) of approximately **£4.3-5.3k per installation per year**.

5.3.2 Manure spreading

Total **compliance costs** are estimated to be approximately **£2.2-7.5 million per year**. These costs would be incurred by the non-IPPC farms currently receiving and spreading manure/slurry as they would have to spread according to BAT. This gives an average cost of approximately **£3.9-13.2k per farm per year** (based on the assumption that just over 550 IPPC-regulated farms are currently exporting manure/slurry and each farm only exports to a single non-IPPC farm). In reality the costs per farm may be slightly lower if an IPPC farm exports manure/slurry to more than one non-IPPC farm. The additional costs for land spreading on non-IPPC sites may lead to a reduction in demand for manure/slurry which could result in the producing farms having to spread greater amounts on-site rather than exporting. If this were the case then the compliance costs presented above would be incurred by existing IPPC installations.

The annualised **administrative costs** are estimated to be approximately **£75-137k per year (for operators)**. This gives an annual administrative cost of approximately **£140-240 per installation per year**. However it is important to note that at this stage it is unclear exactly how this proposed change would be implemented and enforced. There may also be some administrative costs for those farms receiving and spreading manure/slurry (for example, record keeping to demonstrate that BAT have been applied) although this has not been included at this stage because of uncertainties relating to the way in which it could be implemented and regulated. Therefore, the costs presented may be underestimated if operators (IPPC and non-IPPC farms) and/or the regulatory authorities have to take any further actions to ensure compliance beyond those highlighted in Section 5.1.2.

6. Benefits

6.1 Approach

6.1.1 Emission reductions

In order to estimate the benefits associated with the proposed changes for agricultural installations the potential reductions in ammonia emissions need to be calculated. The baseline ammonia emissions have been calculated for the poultry installations and manure spreading activity that is likely to be affected by the proposed changes to the Directive. These figures are presented in Section 4.

The EA and BPC have indicated that the application of IPPC requirements at an intensive poultry installation is expected to reduce total ammonia emissions from the site by approximately 30%. Therefore, for the purposes of this study it has been assumed that the combined abatement efficiency of the measures outlined in Section 5.2.1 is 25-35%. These figures can be applied to the baseline ammonia emissions to estimate the reduction in emissions that may be realised.

For manure spreading, the following abatement efficiencies have been applied:

Table 6.1 Abatement efficiency (manure spreading techniques)

	Assumed abatement efficiency	Source
Pigs - trailing hose (for application of slurry to grassland)	30%	UK ammonia emissions inventory and projections (IGER, version 3rd October 2007)
Pigs - rapid incorporation of manure by disc (within 24 hours)	35%	EA IPPC Pigs and Poultry Annex 1 - 2007/08
Pigs - rapid incorporation of slurry by disc (within 24 hours)	30%	UK ammonia emissions inventory and projections (IGER, version 3rd October 2007)
Poultry - rapid incorporation on arable land by disc (within 24 hours)	55%	EA IPPC Pigs and Poultry Annex 1 - 2007/08

These values have been applied to the emissions estimated in Section 4.2.2 to calculate the potential reduction in ammonia emissions from applying BAT to manure spreading off-site.

6.1.2 Damage cost functions

Intensive agricultural installations affect the environment and human health through the release of pollutants including ammonia, dust, nutrients from manure/litter/slurry, effluent discharges, odour and noise. The impacts of these emissions may include:

- Damage to ecosystems;
- Acidification;
- Eutrophication;
- Adverse effects on human health such as respiratory irritation;
- Build up of substances in solids;
- Reduction of amenity.

The main impacts of the proposed changes will be a reduction in ammonia emissions to air from poultry installations and spreading of manure from intensive pig and poultry units. The potential impacts on ammonia emissions of the measures described in Section 5 have been estimated based on published data on the abatement efficiencies of particular techniques. These have been applied to the baseline ammonia emissions presented in Section 4 in order to estimate the absolute emission reductions that may result from the proposed changes. There may also be impacts on dust emissions from poultry installations although no data was available on the potential effects so they have not been quantified.

Due to the tight timescales involved for the preparation of this report it has not been possible to undertake detailed environmental and health impacts modelling. Therefore, the potential benefits (damage costs avoided) that may be realised if the calculated ammonia emission reductions are achieved have been estimated through the application of the damage cost functions developed by the Defra-led Interdepartmental Group on Costs and Benefits (IGCB)^{26,27}. For comparison with the European Commission's EU-wide impact assessment, potential benefits have also been estimated using the cost-benefit analysis developed under the

²⁶ AEAT (2006): Damage costs for air pollution. Final report to Defra, March 2006. Available from: <http://www.defra.gov.uk/environment/airquality/publications/stratreview-analysis/damagecosts.pdf>

²⁷ IGCB (2007): Economic analysis to inform the Air Quality Strategy. Final report, July 2007. Available from: <http://www.defra.gov.uk/environment/airquality/publications/stratreview-analysis/index.htm>

CAFE programme²⁸. A range of values have been calculated under the CAFE programme to take account of variation in the methodologies used to value mortality; this reflects the use of the median and mean estimates for the value of a life year (VOLY) and statistical life (VSL).

The IGCB and CAFE damage cost functions vary quite significantly for many pollutants. The main differences relate to:

- The use of different pollution metrics (IGCB uses PM2.5 and CAFE uses PM10);
- 6.5% higher UK population estimate for CAFE than IGCB;
- IGCB only uses YOLL (years of life lost) whereas CAFE uses YLL (years life lost) and VSL (value of a statistical life);
- The impact matrix used;
- CAFE places much higher values of health endpoints, with the high CAFE value 2.75 times higher than the IGCB value;
- The IGCB figures discount (@3.5% p.a.) and uplift (@2% p.a.) values in accordance with the HM Treasury Green Book whereas CAFE does not; and
- CAFE includes a much wider range of morbidity effects equating to approx 10% of total impact value.

In addition, sectorally disaggregated damage cost functions have been developed for particulate matter (PM) by the IGCB.

The damage cost functions applied to calculate benefits are presented in the table below.

Table 6.2 Damage cost functions for ammonia (2008 prices)

Source	Central value (£/tonne of NH ₃)	Low (£/tonne of NH ₃)	High (£/tonne of NH ₃)
IGCB ¹	1,971	1,537	2,240
CAFE ²	25,573	12,977	38,168

Note 1: Figures provided by Defra (18th February 2008)

²⁸ Available from: http://www.cafe-cba.org/assets/marginal_damage_03-05.pdf

Note 2: Assuming an exchange rate of £1=€1.31

It is important when applying and interpreting damage cost functions to note that a number of impacts are not taken into account in the quantification; this includes impacts on ecosystems and cultural heritage. Therefore, the benefits estimated through the application of damage cost functions may be underestimated.

In addition, the benefits presented in following sections are only those that may be realised in the UK if the UK were to adopt the proposed changes in the IE(IPPC)D. They do not take into account the additional benefits that may be achieved in the UK from the rest of the EU implementing the proposed changes and vice-versa (i.e. transboundary impacts).

6.2 Results

6.2.1 Poultry Installations

Emission reductions

Applying an abatement efficiency of 25-35% to the BAU ammonia emissions from the installations likely to be affected by the proposed change in threshold gives an emission reduction of 0.82-1.15 kt per year.

Reducing ammonia emissions will also result in reductions in odour emissions although these have not been quantified.

Benefits

A reduction in ammonia emissions of approximately 0.82-1.15 kt per year will lead to estimated benefits of approximately £1.6-2.3 million applying the IGCB values (£1.3-2.6 million when applying the low and high damage cost estimates) and approximately £21.0-29.4 million when applying the CAFE figures (£10.7-43.9 million when applying the low and high damage cost estimates).

Where ammonia that is not lost to the atmosphere is successfully harnessed as a nutrient for the benefit of crops, there will be savings in the costs of purchased fertilisers paid by farmers. Due to data and time constraints this has not been quantified.

6.2.2 Manure Spreading

Emission reductions

The estimated ammonia emission reductions associated with the application of BAT for manure spreading off-site is presented in the table below.

Table 6.3 Emissions abatement (manure spreading techniques)

	BAU ammonia emissions (kt per year)	Abatement technique	Assumed abatement efficiency^{1,2}	Ammonia emission reductions (kt per year)
Pig slurry – grassland	0.05-0.29	Trailing hose	30%	0.01-0.09
Pig slurry – arable land	0.05-0.29	Rapid incorporation by disc (within 24 hours)	30%	0.01-0.09
Pig manure – grassland	0.00-0.02	None	-	0.00
Pig manure – arable land	0.04-0.19	Rapid incorporation by disc (within 24 hours)	35%	0.01-0.06
Poultry – grassland	0.55-1.78	None	-	0.00
Poultry – arable land	4.94-16.02	Rapid incorporation by disc (within 24 hours)	55%	2.72-8.82
Totals	5.64-18.59			2.76-9.05

Note 1: UK ammonia emissions inventory and projections (IGER, version 3rd October 2007)

Note 2: EA IPPC Pigs and Poultry Annex 1 - 2007/08

The application of BAT to manure spreading off-site could result in a reduction in emissions of approximately 50% with the most significant reductions for poultry manure spreading as

approximately 69% of poultry manure is currently exported. Total emission reductions and associated benefits may be approximately 10% higher if scaled to include potential impacts in Scotland and Wales - see Section 4.1.2 for details of approach to scaling.

Reducing ammonia emissions will also result in reductions in odour emissions although these have not been quantified.

Benefits

A reduction in ammonia emissions of approximately 2.8-9.05 kt will lead to estimated benefits of approximately £5.5-17.9 million applying the IGCB values (£4.3-20.3 million when applying the low and high damage cost estimates) and approximately £70.7-231.6 million when applying the CAFE figures (£35.9-345.7 million when applying the low and high damage cost estimates).

Where ammonia that is not lost to the atmosphere is successfully harnessed as a nutrient for the benefit of crops, there will be savings in the costs of purchased fertilisers paid by farmers. Again due to data and time constraints this has not been quantified.

6.3 Summary

The application of IPPC requirements to the installations that may be affected by a change to the poultry threshold is estimated to lead to a reduction in ammonia emissions of approximately **0.8-1.2 kt per year**. This will lead to associated benefits of approximately **£1.6-2.3 million** applying the IGCB values (£1.3-2.6 million when applying the low and high damage cost estimates) and approximately **£21.0-29.4 million** when applying the CAFE figures (£10.7-43.9 million when applying the low and high damage cost estimates).

The application of BAT to manure spreading off-site could result in a reduction in ammonia emissions of approximately **2.8-9.1 kt per year** (approximately 50%) with the most significant reductions for poultry manure spreading as approximately 69% of poultry manure is currently exported. This will lead to associated benefits of approximately **£5.5-17.9 million** applying the IGCB values (£4.3-20.3 million when applying the low and high damage cost estimates) and approximately **£70.7-231.6 million** when applying the CAFE figures (£35.9-345.7 million when applying the low and high damage cost estimates).

The benefits presented based on the IGCB damage cost functions only relate to those that may be realised in the UK if the UK were to adopt the proposed changes in the IE(IPPC)D. They do not take into account the additional benefits that may be achieved in the UK from the rest of the EU implementing the proposed changes and vice-versa (i.e. transboundary impacts). In addition, there are numbers of additional benefits that may be realised which cannot be

quantified at this stage and/or the damage cost functions do not take into account. For example, a reduction in ammonia emissions will also result in reductions in odour emissions.

7. Competition Assessment

The competition guidelines (August 2007)²⁹ set out four main questions, which requires asking whether the proposed revisions in the IPPC Directive would affect the market by:

- i. Directly limiting the number or range of suppliers?
- ii. Indirectly limiting the number or range of suppliers?
- iii. Limiting the ability of suppliers to compete?
- iv. Reducing suppliers' incentives to compete vigorously?

A brief summary of the four questions are presented below in Table 7.1 and for those where the answer to one of the questions is "Yes", then an explanation is provided in the following sections.

The results should be included in the "Evidence Base" within the Impact Assessment template.

Table 7.1 Summary of the competition test

Question	Poultry Installations	Manure Spreading
Q1. Directly limit the number or range of suppliers?	No	No
Q2. Indirectly limit the range of suppliers?	Yes	No
Q3. Limit the ability of suppliers to compete?	Yes	Yes
Q4. Reduce suppliers' incentives to compete vigorously?	No	No

7.1 Poultry Installations

Table 4.1 shows that a significant number of poultry farms in the UK will be affected by revisions in the IPPC Directive (254). The estimated annual cost to affected farmers is in the region of £12k per farm and the estimated additional annualised capital cost to comply with IPPC is in the

²⁹ http://www.offt.gov.uk/shared_ofi/reports/comp_policy/oft876.pdf

region of £1k (e.g. costs associated with the requirements to limit condensation, air-drying of manure, etc). This represents an estimated 12-13% loss in profits (further details are presented in the next section).

The market for poultry ranges from the buying and selling of livestock to the buying and selling of frozen poultry cuts. These are shown in Table 7.2. In most instances UK poultry farmers are competing with other EU Member States' farmers. Only frozen poultry is more exposed to international trade, although UK trading is predominately within a European market. The specific trading Member States are shown in more detail in Table 7.3 and Table 7.4. The focus of the remainder of this section is therefore on intra-EU competition i.e. the effects revisions in the IPPC Directive could have on UK poultry farmers in competition with EU producers.

Table 7.2 UK trade statistics for 2007

	Live Poultry	Poultry not cut in pieces: fresh or chilled	Poultry not cut in pieces: frozen	Poultry cuts and other offal: Fresh or chilled	Poultry cuts and offal (not including liver): Frozen
Percentage of UK imports from EU27	99%	100%	76%	100%	87%
Percentage of UK exports to EU27	98%	98%	79%	100%	80%

Compiled using data from: www.uktradeinfo.com

Table 7.3 UK trade statistics for 2007 – Imports

UK Imports from EU 27	Live Poultry	Poultry not cut in pieces: fresh or chilled	Poultry not cut in pieces: frozen	Poultry cuts and other offal: Fresh or chilled	Poultry cuts and offal (not including liver):Frozen
Belgium	0.3%	11%	5%	7%	3%
Denmark	0.1%	0%	14%	0.2%	6%
Irish Republic	66%	12%	23%	4%	8%
France	15%	24%	9%	8%	9%
Germany	6%	5%	25%	11%	6%

Table 7.3 (continued) UK trade statistics for 2007 – Imports

UK Imports from EU 27	Live Poultry	Poultry not cut in pieces: fresh or chilled	Poultry not cut in pieces: frozen	Poultry cuts and other offal: Fresh or chilled	Poultry cuts and offal (not including liver): Frozen
Netherlands	13%	36%	14%	53%	56%
Poland	0%	11%	3%	11%	6%
Other EU 27	0%	2%	8%	6%	8%

Compiled using data from: www.uktradeinfo.com

Table 7.4 UK trade statistics for 2007 – Exports

UK Exports To EU 27	Live Poultry	Poultry not cut in pieces: fresh or chilled	Poultry not cut in pieces: frozen	Poultry cuts and other offal: Fresh or chilled	Poultry cuts and offal (not including liver): Frozen
Belgium	0%	2%	0.5%	0.2%	5%
Denmark	0%	1%	19%	1%	1%
Irish Republic	98%	89%	15%	13%	9%
France	0.3%	3%	10%	4%	15%
Germany	0.3%	0%	34%	19%	7%
Netherlands	0.2%	4%	8%	50%	32%
Poland	0.1%	1%	0%	11%	7%
Other EU 27	1%	1%	13%	1%	25%

Compiled using data from: www.uktradeinfo.com

Firstly, it is worth noting that larger EU installations will also be subject to compliance with the IPPC Directive³⁰ whilst other installations will continue to fall below the livestock threshold (e.g. fewer than 11,500 turkey places – see section 4.1.1 for further details). By introducing common species-specific thresholds, farms of a similar size/make up are being subjected to the same regulatory compliance, which creates less market distortion within the EU.

³⁰ the BAT requirements will vary on a Member State level

However, the additional burden on the affected farms is likely to lead to more farms becoming unprofitable. In the Cumulative Impact Analysis³¹ (Defra, Dec 2006), the combined effect of IPPC compliance and the EU Meat Chicken Welfare Directive is likely to make an additional 10% of poultry production unprofitable. This regulatory pressure increases the competitive advantage of those farmers with larger farms who benefit from economies of scale (e.g. ability to spread the cost of labour over more birds, or purchase feedstock at a lower price due to bulk purchases) and who also have greater flexibility to mitigate effects (e.g. they may be able to secure better loan repayment rates compared to smaller and more risky farms). However, it is also worth noting that revenues for poultry have been increasing and are likely to continue to increase, especially for specialist poultry that can satisfy the EU's more stringent requirements on their feed and general health (e.g. due to vaccinations). However this has mostly been to account of the rising costs of cereal (the main component of poultry feed).

Farms below these proposed IPPC thresholds (both in the UK and other EU Member States) are likely to become more competitive over those farms above the thresholds. The scale of the relative change in competitiveness will depend on the proportion of production from poultry farms below the thresholds as a proportion of production from all poultry farms. It is not possible to determine the number of farms below this threshold using publicly available information because their relatively small number means that information is not released, so as to protect commercial confidentiality.

It is unlikely that farmers will be able to pass on the costs of IPPC just because IPPC legislation will be imposed at an EU level. This is because these farmers are usually not large enough to be able to dictate prices to larger buyers (i.e. they are price takers not price makers) and these affected farms are likely to be competing with larger farmers who are already complying with IPPC and therefore have no reason to also increase their prices if it could affect their short term profitability or long term viability.

The additional compliance burden (e.g. costs of storage units, covers, shelter, permits, administration, labour costs, etc.) may also act as a deterrent for new entrants who are likely to be captured under IPPC. The estimated annual cost of £12k is a significant one. Another possibility is that more new entrants will operate below the livestock threshold leading to smaller farms and fewer livestock per farm. This could lead to more resources (e.g. labour and capital) being inefficiently used than larger intensive farms. Additionally, these compliance measures will limit poultry farmers' freedom to organise their own production processes by setting

³¹ The report is titled: Cumulative impact of forthcoming regulatory proposals on the economics of farming – Update 2, Update 2 of the supporting document for Partners for Success – a farm regulation and charging strategy

constraints on the way they handle slurries, manures and organic matter (and many other aspects of their business).

Currently, there is a high demand for grain, oilseed rape etc., due to population growth and affluence in developing/emerging nations, poor harvests and growing interest in biofuels, leading to higher prices. This could mean that farmers with both arable crops and pigs may revert to arable farming only. This scenario could extend to existing and new entrants. This will be dependent on whether the land is suitable for arable farming and large enough to be viable.

Up until now the costs have been considered in isolation of other policies. Under proposed extensions to the Nitrates Directive, more farmers will be in Nitrate Vulnerable Zones (e.g. in England currently 55% is NVZ and proposals are in place to increase this to either 70% or the whole of the country). Farmers in NVZs are required to store, and not spread, manure during closed periods and to maintain a minimum storage capacity of 5 or 6 months (depending on manure/slurry type). This will require farmers to invest in storage facilities (e.g. weeping walls, lagoons, tanks, pits, etc.). Given changes in the Nitrates Directive will be imposed before the revisions in IPPC comes into force, much of the capital costs and annual costs will be BAU practices. Therefore, for affected farmers in NVZs, the costs directly attributable to IPPC will be significantly lower.

The revisions to the IPPC Directive are also likely to have upstream effects on the demand for suppliers of specific feedstuffs (which minimise excretion of nitrogen and phosphorous), covers for manure storage (e.g. plastic sheeting to reduce ammonia volatilisation) and poultry housing (e.g. full slats). Given that there is time for farmers to comply with the regulations, there is unlikely to be significant (short-term) boost to demand for slurry/manure stores. Any significant increase in demand (short term) will be more attributable to farmers who need to comply with changes to the Nitrates Directive and compliance with the Water Framework Directive.

7.2 Manure Spreading

Currently under the IPPC Directive, pig and poultry farmers already have to use BAT for spreading any manure on their farm. However, there is no legal obligation to ensure that exported manure which is spread also uses a BAT spreading technique. The proposed revision to the IPPC Directive now requires that exported manure which is spread, should be spread using the BAT. These compliance measures will limit poultry and pig farmers' freedom to organise their own production processes by setting constraints on the way they dispose and spread and manage slurries, manures and organic matter. Any manure which is exported but not spread is not subject to compliance under IPPC (e.g. 670,000 tonnes of poultry manure that is exported is used by power stations as a fuel source). Further, some of the manure may be exported to farms already covered by IPPC regulations. Therefore, we are only interested for

the purposes of this impact assessment in the proportion that is exported from IPPC farms and is spread on non-IPPC farm land. This was shown in Table 4.2 and Table 4.3.

The main advantage of exporting manure (and pig slurry) is that there is an avoided cost of not having to store and then spread manure onsite. If the farmer is also in a NVZ, they would be unable to spread manure (and pig slurry) during the closed period and would be required to store this manure (and pig slurry). Clearly the incentives to export manure and pig slurry (and therefore the avoided cost of onsite storage and spreading) will help the farm mitigate costs taking into consideration the costs of transporting manure (it will only be economically viable to export manure within say a 20km radius, after which it would be cheaper to store and spread the manure onsite). From the recipients' perspective, being able to import manure/slurry can be a cheap source of nutrients and organic matter, especially valuable to a farm without its own livestock.

Table 8.3 shows the annual cost per farm if these manures and slurries were spread onsite and can be used as an indication of the scale of avoided costs (however, they are an overestimate as they do not include the cost of transporting manure offsite). The value of this annual avoided cost is currently a significant saving for poultry farmers (£17k) given the high volume of manure exported. This is because poultry manure is a valuable by-product of poultry production. As with other livestock manure it can be used by spreading it on agricultural land where the organic matter and nutrients can be beneficial to the soil and plants. Because poultry manure is easier to transport and higher in NPK it is more marketable as a fertiliser or used in anaerobic digesters. The savings in avoided cost to pig farmers (around £5k) is much smaller as more slurry and manure is used onsite. It is important to remember that 25% or so of pig rearing is now outdoor units which fall outside IPPC regulation.

Regardless of the revisions in the IPPC Directive there is still likely to be a reasonably good demand for exported manure as it is cheaper than buying wholesale fertiliser (in many instances it is given away for free and, although the nutrient value can be replaced by manufactured fertiliser, the organic matter is less easily found elsewhere, so the demand could be close to the BAU level). If demand for manure and slurry remains unchanged and these farmers are willing to spread the manure and slurry using BAT then this avoided cost savings will continue. There is too much uncertainty to be able to estimate the change in demand for manure and slurry and also what percentage of these farmers already spread using BAT. Therefore, these costs should be viewed as the upper end of the range of estimates, but in reality the real costs are likely to be much lower.

However, this avoided cost may become less substantial in the future, firstly as there is likely to be more competition to give manure to farmers with grassland and arable land who are willing to accept and spread this manure (likely to reduce within NVZs). Secondly these farmers must now be willing to spread the manure using the BAT (e.g. the cost of the spreading technique,

administrative costs of compliance with IPPC, etc.). However, given the low cost of BAT spreading compared to the cost of fertiliser some of these farmers are likely to continue to accept the manure and slurry, whilst other farmers may only accept manure if the exporting farmer pays for the additional cost (e.g. a gate fee).

Farmers in NVZs are likely to be unwilling to accept manure due to the effects of the closed period, the minimum storage capacity requirement and the 170kgN/ha whole farm limit. Therefore, those farms affected by IPPC and/or NVZ farmers are both likely to be competing to give manure to farmers who are currently not restricted by IPPC and NVZ regulations and are willing to spread the manure using the BAT. This may increase the likelihood that farmers will charge a fee for accepting manure (e.g. a gate fee), making exporting less attractive, or as a worst case scenario meaning that farmers will now have the additional burden of the costs of storing and spreading this manure onsite.

As mentioned earlier in the report, one factor that may be of concern is the current financial crisis facing pig farmers. Contemporary reports suggest that many pig farmers are operating at a financial loss and cannot sustain their businesses. The net effect of the additional costs of further regulation could be that more farmers will leave the industry than would otherwise be the case. As a consequence, the number of affected farmers will probably decline. These farmers are usually not large enough to be able to dictate prices to larger buyers (i.e. they are price takers not price makers) and are likely to face a lot of competition from larger EU pig farms and the risk of imports from new Member States, with their lower cost base (especially Poland, which has a large pig herd).

This may encourage interest in the potential to use anaerobic digestion (AD) as a means of disposing of surplus manure and pig slurry. Entec (2007) conducted a review of AD as part of the impact assessment for the Nitrates Directive. The report³² findings indicated that:

- only centralised AD (CAD) plants and in only a few locations in England are likely to be economically viable in the short term future;
- to be attractive to farmers, the CAD plant will need to be willing to accept delivery of organic manures and slurries within a pattern that means the farmer does not have to construct greater storage capacity (either for manures awaiting delivery to the CAD plant or by-product returned from the plant);

³² Entec (2007): Assistance on the Partial RIA including Extended Nitrate Vulnerable Zones in England
<http://www.defra.gov.uk/environment/water/quality/nitrate/pdf/consultation-supportdocs/g4-assist-partialria.pdf>

- because the process does not consume nitrogen, the N-rich by-product (called digestate) may offer little benefit in terms of reduced organic N loading if returned to the farm of origin, where it would still have to be stored and spread (according to closed period restrictions if on an NVZ farm). Because CAD plants usually also take in organic wastes from other sources, the farmer may have more N to dispose of in the digestate than was originally produced on the farm;
- if the digestate was instead re-distributed to farmers in need of nutrients, farmers will benefit to the extent that they treat the digestate they use as a substitute for purchased inorganic fertiliser;
- given the characteristics of the liquid digestate, participating farmers could make savings but details of the digestate's analysis are not yet available so it is not possible to quantify possible savings.

Overall, the AD process does have potential to reduce the cost to farmers of reducing diffuse nitrogen pollution and help them comply with the proposed revisions to the IPPC Directive (and revisions in the NVZ Action Programme). Provided IPPC farmers are in the vicinity of a CAD plant and the nutrient rich digestate can be re-distributed to farms requiring extra nutrient inputs, AD can help farmers achieve their nutrient balances and reduce the amount of inorganic mineral fertiliser that would need to be purchased. Therefore, the revisions in the Directive could stimulate demand in the AD market but unlikely to be seen immediately given the compliance date is still far off.

8. Distributional Effects On Different Size Firms

8.1 Poultry Installations

The estimated annual cost to affected poultry farmers is in the region of £12k per farm. This is shown below in Table 8.1. This represents an estimated 12-13% loss in profits (see Table 8.2).

Table 8.1 Annual costs per poultry installations (£)

Annual cost per farm (£)	
Annualised compliance capital cost	1,159
Annual cost of compliance	6,334
Annualised administrative cost	4,650 (based on average of 4,173 - 5,127)
Total	£12,143

It is important to see these additional costs in the context of the net income of the typical farms within the sectors affected. Information on farm incomes can be obtained from the Farm Business Survey³³. The latest figures available are for 2005/06 and 2006/07, and so are compatible with the data used in previous analysis. Relevant data are provided in Table 8.2. These include income and costs from all enterprises on farms included in the survey, including figures for agricultural enterprises other than the dominant one, diversified (i.e. non-agricultural) enterprises, agri-environment scheme payments and Single Payment Scheme.

It should be noted that whilst the 2006/07 survey data is the most up-to-date data available, it does not reflect the current financial state of the sector where feed costs have dramatically increased in the last year. It should also be noted that figures are not necessarily representative for smaller installations.

³³ See: <http://statistics.defra.gov.uk/esg/publications/fab/2007/excel.asp>

Table 8.2 Gross Margin and Farm Business Incomes (£/farm)

Poultry Installations	2005-06	2006-07	% change
Before IPPC revisions			
Total Gross Margin	£238,580	£250,595	5
Farm Business Income ³⁴ (FBI)	£93,166	£101,223	8
Estimated FBI inclusive of IPPC revisions to poultry installations			
FBI with IPPC compliance	£81,023	£89,080	-
Loss of profit (%)	13%	12%	-

Note these effects are only felt by farmers who are will be affected by revisions to the poultry threshold. Therefore, all micro³⁵ and the majority of small-sized poultry farms are unlikely to be affected by revisions in the IPPC directive, although some small size farms and medium sized poultry farms will be affected. Larger poultry farmers (i.e. those with >40,000 places) are already subject to IPPC regulation and therefore will be unaffected by the revisions. .

It is also worth noting that these estimates are based on average costs so the estimated loss in profits could be an under or overestimate. This is likely to apply to seasonal livestock producers (e.g. turkey farmers during Christmas) who could be more adversely affected having to comply with IPPC requirements (e.g. permits, covers, etc) even if for most of the year they are below the threshold (in practice, they may decide to operate at a level just below the threshold to avoid the need to seek a permit).

8.2 Manure Spreading

The estimated annual cost to affected poultry farmers is in the region of £17k per farm and £5k for pig farmers. This is shown below in Table 8.3. This represents an estimated 16-17% loss in profits for poultry farms and an estimated 17-21% loss in profits for pig farms (see Table 8.4). It is important to stress that these are the costs of storing and spreading manure/slurry onsite rather than being exported and, therefore, represent the costs under a worst case scenario. If demand for manure and slurry remains unchanged and importing farmers are willing to spread the manure and slurry using the BAT, then there will be no cost to exporting farmers (although

³⁴ Farm business income is a measure which represents the financial return to all unpaid labour and on the farmer's own capital invested in the farm business. It is a broad measure of the income received from all the activities of the farm, including diversified activities - after costs have been paid

³⁵ For statistical purposes we have used farm sizes used by DIUS:
<http://www.berr.gov.uk/dius/innovation/nms/faqs/page32346.html>

exporting farmers may be asked to do any necessary paperwork for the importing farmer). These costs can also be used to show the upper range cost to those farmers who import manure and slurry but now have to spread the manure using the BAT, assuming they previously did not use BAT. There is too much uncertainty to be able to estimate the change in demand for manure and slurry and also what percentage of these farmers already spread using BAT. Therefore, these costs should be viewed the upper costs, but in reality the real costs are likely to be much lower.

Table 8.3 Annual costs per poultry installations (£)

Annual cost per farm (£)	Poultry		Pigs	
	Low	High	Low	High
Annual cost of compliance	£16,647	£17,260	£4,573	£5,005
Annualised administrative cost	150	250	150	250
Total annual cost	£16,797	£17,510	£4,723	£5,255
Average total annual cost	£17,153		£4,989	

It is important to see these additional costs in the context of the net income of the typical farms within the sectors affected. Information on farm incomes can be obtained from the Farm Business Survey³⁶. The latest figures available are for 2005/06 and 2006/07, and so are compatible with the data used in previous analysis. Relevant data are provided in Table 8.4. These include income and costs from all enterprises on farms included in the survey, including figures for agricultural enterprises other than the dominant one, diversified (i.e. non-agricultural) enterprises, agri-environment scheme payments and Single Payment Scheme.

It should be noted that whilst the 2006/07 survey data is the most up-to-date data available, it does not reflect the current financial state of the sector where feed costs have dramatically increased in the last year. It should also be noted that figures are not necessarily representative for smaller installations.

³⁶ See: <http://statistics.defra.gov.uk/esg/publications/fab/2007/excel.asp>

Table 8.4 Gross Margin and Farm Business Incomes (£/farm)

Farm Type	Poultry			Pigs		
	2005-06	2006-07	% change	2005-06	2006-07	% change
Before IPPC revisions						
Total Gross Margin	£238,580	£250,595	5	£127,270	£129,701	2
Farm Business Income (FBI)	£93,166	£101,223	9	£30,255	£24,706	-18
Estimated FBI inclusive of IPPC revisions to manure spreading						
FBI with IPPC compliance	£77,079	£85,136	-	£24,963	£19,414	-
Loss of profit (%)	17%	16%	-	17%	21%	-

9. Summary

9.1 Poultry Installations

An estimated 254 poultry installations are likely to be affected by the proposed change in the IPPC poultry threshold. BAU ammonia emissions from these installations are approximately 3.3kt per year (housing, manure storage and land spreading).

The compliance and administrative costs that these sites and regulatory authorities may incur due to the proposed changes are summarised in the table below.

Table 9.1 Summary of compliance and administrative costs (poultry installations)¹

Cost element	Total annualised cost (£million per year)	Average annual cost per installation (£k per year)
Compliance costs	1.9	7.5
- operators	1.9	7.5
Administrative costs	1.1-1.3	4.3-5.3
- operators	1.1-1.3	4.2-5.1
- regulatory authorities	0.04	0.2
Total	3.0-3.2	11.8-12.8
- operators	3.0-3.2	11.7-12.6
- regulatory authorities	0.04	0.2

Note 1: Note that total costs may not exactly match the sum of disaggregated costs due to rounding.

The estimated compliance cost per farm per year (£7.5k) compares favourably with the Commission's analysis which estimated compliance costs to be approximately €11.1k (£8.4k) per farm per year (based on total annual compliance costs of approximately €10 million (£7.7 million) for around 900 farms excluding administrative costs). With the inclusion of administrative costs the cost per farm estimated in this study rises to approximately £12-13k per year.

The estimated emission reductions and associated benefits are presented in the table below; benefits have been calculated separately based on the damage cost functions developed by the

Defra-led IGCB and those developed by the European Commission under the CAFE programme.

Table 9.2 Summary of emission reductions and associated benefits (poultry installations)

BAU ammonia emissions from affected installations (kt/year)	Ammonia emission reductions (kt/year)	Benefits (damage costs avoided) (£million/year)
3.3	0.8-1.2	<ul style="list-style-type: none"> • Based on IGCB damage cost functions: 1.6-2.3 (1.3-2.6) • Based on CAFE damage cost functions: 21.0-29.4 (10.7-43.9)

The estimated compliance and administrative costs and reduction in emissions gives a cost effectiveness of approximately £2,500-3,800 per tonne of ammonia abated (total costs divided by emission reductions). The Commission’s IA presented an abatement cost of €1,000 per tonne of ammonia abated (~£770) although this excluded any administrative costs and assumed a greater reduction in emissions on average per installation (11 tonnes of ammonia reduced per year per installation compared to 4-5 tonnes estimated from the analysis for this study).

The total costs (compliance and administrative) that may be incurred by the poultry installations likely to be affected by a change in the IPPC threshold and the regulatory authorities are slightly higher than the associated benefits calculated using the IGCB damage cost functions. However, they are significantly lower (by an order of magnitude) than the benefits calculated by applying the CAFE values.

9.2 Manure Spreading

Approximately 610kt of pig slurry and 2,600kt of pig and poultry manure are currently exported from IPPC regulated sites each year. Approximately 670kt of poultry manure is currently exported to power stations for combustion so the remaining slurry and manure exported (450kt and 1,900kt, respectively) represents the maximum amount that may currently not be spread according to BAT and affected by the proposed changes in the IE(IPPC)D. However, a large number of farms are situated in Nitrate Vulnerable Zones (NVZs) as defined under the Nitrates Directive and may already be spreading slurry or manure according to BAT. Therefore, a low and high scenario have been established with the low scenario assuming that slurry/manure

produced in a NVZ is already spread according to BAT and the high scenario that all exported manure/slurry is not spread according to BAT (excluding that sent to power stations).

BAU ammonia emissions from the spreading of exported manure and slurry are approximately 5.6-18.6kt per year. The compliance and administrative costs that exporting and receiving sites and regulatory authorities may incur due to the proposed changes are summarised in the table below.

Table 9.3 Summary of compliance and administrative costs (manure spreading)¹

Cost element	Total annualised cost (£million per year)
Compliance costs	2.2-7.5
- operators	2.2-7.5
Administrative costs	0.08-0.1
- operators	0.08-0.1
- regulatory authorities	<i>Assuming costs covered by variation fee paid by operators</i>
Total	2.3-7.6
- operators	2.3-7.6
- regulatory authorities	<i>Assuming costs covered by variation fee and existing subsistence fees paid by operators under IPPC</i>

Note 1: Note that total costs may not exactly match the sum of disaggregated costs due to rounding.

Total compliance and administrative costs are estimated to be approximately £2.6-8.5 million per year if scaled to include potential impacts in Scotland and Wales. However, this is highly uncertain due to a lack of available data for Scotland and Wales (see Section 4.1.2 for details of approach to scaling).

The compliance costs outlined above would be incurred by the non-IPPC farms currently receiving and spreading manure/slurry as they would have to spread according to BAT. The estimated compliance cost per farm is difficult to calculate as it is not known exactly how many non-IPPC farms may be receiving and spreading manure/slurry. Assuming that just over 550 farms are currently exporting manure/slurry and each farm only exports to a single non-IPPC farm then the average cost per farm would be approximately £3.9-13.2k per. In reality the costs

per farm may be slightly lower if an IPPC farm exports manure/slurry to more than one non-IPPC farm. The additional costs for land spreading on non-IPPC sites may lead to a reduction in demand for manure/slurry which could result in the producing farms having to spread greater amounts on-site rather than exporting. If this were the case then the compliance costs presented above would be incurred by existing IPPC installations.

In addition, it is important to note that at this stage it is unclear exactly how this proposed change would be implemented and enforced. There may also be some administrative costs for those farms receiving and spreading manure/slurry (for example, record keeping to demonstrate that BAT have been applied) although this has not been included at this stage because of uncertainties relating to the way in which it could be implemented and regulated. Therefore, the costs presented may be underestimated if operators (IPPC and non-IPPC farms) and/or the regulatory authorities have to take any further actions to ensure compliance beyond those highlighted in Section 5.1.2.

The estimated emission reductions and associated benefits are presented in the table below; benefits have been calculated separately based on the damage cost functions developed by the Defra-led IGCB and those developed by the European Commission under the CAFE programme.

Table 9.4 Summary of emission reductions and associated benefits (manure spreading)

BAU ammonia emissions from affected installations (kt/year)	Ammonia emission reductions (kt/year)	Benefits (damage costs avoided) (£million/year)
5.6-18.6	2.8-9.1	<ul style="list-style-type: none"> Based on IGCB damage cost functions: 5.5-17.9 (4.3-20.3) Based on CAFE damage cost functions: 70.7-231.6 (35.9-345.7)

Total emission reductions and associated benefits may be approximately 10% higher if scaled to include potential impacts in Scotland and Wales. However, this is highly uncertain due to a lack of available data for Scotland and Wales (see Section 4.1.2 for details of approach to scaling).

The estimated compliance and administrative costs and reduction in emissions gives a cost effectiveness of approximately £800 per tonne of ammonia abated (total costs divided by emission reductions). The Commission's IA presented an abatement cost of €2,400 per tonne

of ammonia abated (~£1,800). Differences in costs may be related to different interpretations of BAT for manure/slurry spreading and the fact that the Commission's cost estimates are for the EU as a whole which may not necessarily reflect the situation in the UK. Applying the Commission's estimated abatement cost gives a total cost of £5-16 million per year.

The total costs (compliance and administrative) that may be incurred by IPPC farms exporting manure/slurry and non-IPPC farms receiving and spreading manure/slurry with the application of BAT are lower by approximately 50% than the associated benefits calculated using the IGCB damage cost functions. In addition, they are significantly lower than the benefits calculated by applying the CAFE values. However, it is important to highlight the administrative costs which may be under-estimated due to the uncertainties surrounding the way in which the proposed change could be regulated.

9.3 Limitations/uncertainties

There are a number of limitations and uncertainties with the approach applied and input data available that should be noted:

- The benefits presented based on the IGCB damage cost functions only relate to those that may be realised in the UK if the UK were to adopt the proposed changes in the IE(IPPC)D. They do not take into account the additional benefits that may be achieved in the UK from the rest of the EU implementing the proposed changes and vice-versa (i.e. transboundary impacts);
- There are numbers of additional benefits that may be realised which cannot be quantified at this stage. For example, a reduction in ammonia emissions will also result in reductions in odour emissions. In addition, the damage cost functions applied to estimate the benefits associated with a reduction in ammonia emissions do not include all benefits such as impacts on ecosystems or cultural heritage;
- Applying damage cost function to estimate benefits does not take into account the geographical location of farms where these reductions are taking place (for example, reductions in emissions from a poultry farm close to a highly populated area will result in greater health benefits than a farm located further away);
- Relatively limited data was available on the volumes of manure currently being exported from IPPC to non-IPPC farms for spreading and the BAU techniques being applied. Therefore, the figures presented in the report only relate to England and Northern Ireland although rough estimates of impacts across the UK have also been presented by applying scaling factors derived from the UK ammonia emissions inventory.