Environmental Legislation in the European Union to Reduce Emissions from Livestock Production

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1 Introduction

1.1 Common Agricultural Policy

In Europe, animal production has traditionally played an important role in economic and cultural terms. In the majority of European Union (EU) Member States the pro rata value of livestock products in some cases far exceeds 50% of the value of total annual agricultural production [1].

The Treaty of Rome establishing the European Economic Community set out the objectives of the agricultural policy in Article 39. The Common Agricultural Policy (CAP) has changed over the years due to changing circumstances and priorities and with the development of new markets and technologies. Since 1992 one of the main objectives of the CAP is to protect the environment and to develop the natural potential of the countryside [2]. It focuses on the reduction in the area of land used for intensive livestock and more sustainable production methods and the prevention of natural resources. Possible measures include i.a. support in return for agri-environmental commitments and direct aid payments only on compliance with environmental requirements.

This policy is continued by the Agenda 2000, which is an action programme in order to give the European Union a new financial framework for the period up to 2006 with respect to the enlargement [3].

1.2 Environmental effects of animal husbandry

Intensive livestock farms have the potential, if not properly managed and controlled, to lead to deterioration in the environment and to cause environmental pollution. Livestock installations and associated activities such as the application of manure on farmland are a significant source of different emissions into air, soil and water, see figure 1 [1,4].

Among gaseous emissions there are to mention unpleasant odours, ammonia, methane and nitrous oxide (so-called greenhouse gases) and dust. Emissions are mainly caused by the decomposition of animal waste (odour, ammonia, nitrous oxide), the digestion of ruminants (methane), the application of manure (ammonia, odour, nitrous oxide) and the feeding and bedding (dust).

Odour nuisance is an old but dominating problem of air pollution on a local level. Increasing numbers of people complain about odour in the neighbourhood of livestock farms. One reason is, that structure of population in villages changes. Another reason is, that applications for new housing developments are increasingly considered near existing livestock units. On the other hand livestock production intensified remarkably in the last years. So prognosis and assessment of odour immissions in the vicinity of livestock farms in most cases are decisive for their continuance and capacity of development.

In context with the discussion on the causes for the forest die-back, ammonia emissions have come into scope of interest in the early eighties. Especially large pig and poultry units in
the vicinity of woodlands and nature reserves are considered to have significant harmful
effects on vegetation and ecosystems due to eutrophication and acidification. Besides local
impacts ammonia emissions from livestock farming contribute to acidification and
eutrophication in remote regions all over Europe.

Figure 1

Sources and Emissions

Agriculture’s contribution to greenhouse gases responsible for global warming is about 8 %
(CO₂-equivalents) on EU level, but especially animal production is the main source of
methane and nitrous oxide (about 41 % each).

Dust is not only a health risk for the farmers working in the housings. There is increasing
concern that small dust particles and micro-organisms and endotoxins associated with dust
particles have the potential to induce or cause respirable diseases to the people living
nearby.

Pollution of soil and water is mainly caused by nitrate and phosphate due to leaching or run-
off after application of manure or directly from leaking storage facilities or accidents. If nitrate
is enriched in groundwater, its quality is reduced and its use as drinking water may not be
possible for health risk. Too high loads both of phosphate and nitrate can lead to
eutrophication of surface waters.

1.3 Relevant environmental legislation in general [1, 5, 6]

To meet environmental problems associated with industrial and livestock production and to
reduce the pollution load a comprehensive body of legal regulations was created over the
last 30 years for the protection of the environment, especially of soil, water and air in the
European Union, see table 1. With respect to livestock production there is also legislation on
animal health and animal welfare that must be taken into consideration for it interferes with
environmental legislation.

Environmental legislation comprises today some 300 legal acts, including directives,
regulations, decisions and recommendations. To this come a large number of
communications and other policy documents of relevance for EU environmental policy. So
European legislation has an increasing influence on the legislation in the Member States and over 80% of legal regulations that are relevant for the industry are of European origin [7].

Legislation is chiefly concerned with limiting pollution by introducing minimum standards, notably for water pollution and air pollution. For example to pretend water pollution a number of directives have been adopted by the Member States to introduce water quality standards (e.g. drinking water and bathing water directives), to reduce and avoid emissions (e.g. Nitrates Directive), to protect water resources and to monitor emissions of pollutants.

Table 1

<table>
<thead>
<tr>
<th>Sector</th>
<th>Legislation (selected Directives)</th>
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<tbody>
<tr>
<td>Horizontal Legislation</td>
<td>* Environmental Impact Assessment (EIA)</td>
</tr>
<tr>
<td>Industrial Pollution Control</td>
<td>* Integrated Pollution Prevention and Control (IPPC)</td>
</tr>
<tr>
<td>and Risk Management</td>
<td>* UNECE Convention on Long-Range Transboundary Air Pollution</td>
</tr>
<tr>
<td>Air Quality</td>
<td>* National emission ceilings for certain atmospheric pollutants (in preparation)</td>
</tr>
<tr>
<td>Water Protection</td>
<td>* Protection of waters against pollution caused by nitrates from agricultural sources (Nitrates Directive)</td>
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<td></td>
<td>* Water Framework Directive</td>
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<td></td>
<td>* Drinking Water Directive</td>
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<tr>
<td>Nature Protection</td>
<td>* Conservation of wild birds (Wild Birds Directive)</td>
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<td></td>
<td>* Conservation of natural habitats and of wild fauna and flora (FFH)</td>
</tr>
<tr>
<td>Animal Welfare</td>
<td>* Minimum standards for the protection of pigs</td>
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<td></td>
<td>* Minimum standards for the protection of laying hens</td>
</tr>
<tr>
<td></td>
<td>* The protection of animals kept for farming purposes</td>
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</tbody>
</table>

To improve air quality and to achieve a significant reduction in air pollution, air quality standards have been established and regulations to avoid and reduce emissions have been introduced. To reduce the supranational effects of ammonia both on EU and UN-ECE level strategies have been developed for the cost-effective reduction of ammonia emissions (Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution to Abate Acidification, Eutrophication and Ground-Level Ozone and EU Directive on National Emission Ceilings for Certain Atmospheric Pollutants as part of Community strategy to combat acidification) [8, 9].

To combat global warming, national and international efforts are combined to reduce emissions of the gases responsible. The EU adopted the United Nations Framework Convention (1992) and the Kyoto Protocol (1997). An 8% reduction of greenhouse gas emissions must be achieved by 2008-2012. To meet this target strategies are developed by the Community at present. Up to now greenhouse gas emissions from animal husbandry are limited only as a side-effect by the legislation on air pollution control [10].

The nature protection sector covers a number of EU legal instruments. Their main provisions are aimed at protecting habitats and wild flora and fauna. The regulations may impose restrictions on farming if certain species and habitats are likely to be affected e.g. by aerial emissions. Most relevant are the Directives on the Conservation of Wild Birds (Wild Birds Directive) and on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive).
For this ‘sectoral’ approaches are not sufficient a ‘horizontal’ and integrated Community approach which takes account of all types (emission to air, soil and water) and causes of pollution (industry, energy, transport, agriculture, etc.) including cross-media effects was developed in the last years.

In this context the directives on Environmental Impact Assessment (EIA) and on Integrated Pollution Prevention Control (IPPC) play an important role for livestock production. The first ensures, that all projects including animal husbandry which are likely to have significant (negative) effects on the environment are subject to environmental impact assessment in the state of planning. The latter intends to avoid, to reduce and to control releases of substances to air, land and water and overall impacts on the environment and human health by any activity, especially industrial and agricultural activities.

1.4 **Principles of transposition of European legislation into national legislation** [11]

The main institutions of the European Union, their functions and the way of legislation are summarised in figure 2. Usually legislation is initiated and prepared by the EU Commission, which has the role of an European government. The members of the Commission are appointed by the governments of the Member States. The legislative proposals have to be adopted both by the Council, which consists of the representatives of the Member States (generally ministers) and the European Parliament, the members of which are elected directly by the European citizens. Due to this constitution the Member States have a strong influence on the European policy.

### Main Institutions of the EU and Legislation

If a law has been adopted by the European institutions, the approximation is a obligation of each Member State of the European Union. It means that member countries of the European Union (15 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom) must align their national laws, rules and procedures in order to give effect to the EU law. This process is known as ‘Transposition’.
Although countries have considerable discretion in choosing the most appropriate national mechanism to reflect Union environmental obligations, this discretion is limited in some respects by general principles of Union law. In most cases it will be necessary to adopt national legislation passed by Parliament or in some countries by Presidential or Governmental Decree. Moreover countries will have to provide the institutions and budgets necessary to carry out the laws and regulations (known as the 'Implementation' or 'Practical Application' of the directive) and to provide the necessary controls and penalties to ensure that the law is being complied with fully and properly ("Enforcement").

The EC (European Community) Treaty establishes some general principles of environmental policy in Article 130r. EU environmental law has to be expressly based on one or more provisions of the Treaty, the most common in the environmental field being Art 100a (Single Market related legislation with environmental dimensions) and Art 130s (purely environmental). For the purposes of approximation, the significance of the legal base of the EU law in question is first of all that it will affect the ability of a country to impose stricter environmental standards than those contained in the EU law in question. For example, if a directive is adopted on the basis of Article 130s, Member States have more opportunity to adopt stronger national measures than if it is adopted on the basis of Article 100a.

Most EU environmental laws are directives. This is a form of law peculiar to the European Union. They are designed to impose obligations on Member States and to be sufficiently flexible to take into account differing legal and administrative traditions. The choice and method of aligning the national legal and administrative system is left to the discretion of the Member State. Directives are binding on all Member States but may contain differing requirements which take into account the different environmental and economic conditions in each Member State.

For this reason, it is not possible to give a complete overview on how European legislation is implemented and enforced in all European Member States. The range is too wide. On the International Congress "Regulation of Animal Production in Europe" held in May 1999 in Wiesbaden, which was organised by the KTBL, it was tried to achieve this aim [1].

The other forms of EU legislation (regulations and decisions) are directly binding in Member States and on the parties to whom they are addressed and more specific. They are not so important in the context discussed in this paper.

The ultimate authority for the legal interpretation of the Treaty and EU legislation has the European Court of Justice. In the last ten years the Court has made an increasing number of decisions concerning the interpretation of EU environmental laws and their approximation by Member States in the context of the establishment of the Single Market. It has also developed important principles concerning the transposition of directives.

To sum up it can be stated, that environmental regulations in EU Member States may differ even if they are based on the same EU law. The EC Treaty allows countries to adopt – or to maintain – national environmental standards and requirements which are more stringent than those contained in EU environmental legislation. But this freedom is not absolute. Some EU environmental directives explicitly allow – or encourage – the Member States to take more stringent measures. That is, they set the minimum standard for compliance, not the maximum standard. This is frequently the case for emission limit values on discharges to air or water, or for environmental quality standards. For example, EU directives on air and water quality often set mandatory limit values for certain pollutants, supplemented with guide values which set environmental quality objectives the Member States should strive to achieve.

2 Overview on European legislation aiming to reduce environmental effects of intensive livestock farming

2.1 Scope of this overview

This paper gives an overview on European legislation with respect to environmental effects of intensive livestock farming. It focuses on emission-related legislation to reduce nitrogen
emissions into air (ammonia), soil and water (nitrates) and the basic horizontal legislation (industrial pollution control and environmental impact assessment). These are the key issues for livestock production. Links between the different regulations are highlighted.

2.2 Legislation to reduce ammonia emissions [8, 9]

In order to reduce the emissions of sulphur oxides, nitrogen oxides, volatile organic compounds and ammonia a Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone was signed under UN-ECE Convention on Long-Range Transboundary Air Pollution from 1979. In addition a Directive on National Emission Ceilings for Certain Atmospheric Pollutants (NEC Directive) is in preparation. The directive has the same objective but is less detailed than the UN-ECE Protocol with respect to control measures that will have to be taken (table 2).

Table 2

Legislation in Order to Reduce Ammonia Emissions

<table>
<thead>
<tr>
<th>Regulations</th>
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<tbody>
<tr>
<td>1. UN/ECE Convention on Long-Range Transboundary Air Pollution - Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone</td>
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<tr>
<th>Measures (only UN/ECE Convention)</th>
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<tr>
<td>- mandatory control measures</td>
</tr>
<tr>
<td>- code of good agricultural practice to control ammonia emissions</td>
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</table>

According to both regulations the emissions of ammonia should be reduced about 20% by 2010 compared to the 1990 emissions on the European level. On the national level emission limits are differentiated for each individual Member State according to the contribution to the total ammonia emissions and environmental effects in Europe by each state.

Under UN-ECE Convention in each state mandatory control measures must be applied and a code of good agricultural practice to control ammonia emissions should be established.

Mandatory measures include low emission application techniques for manure and low emission housing and manure storage systems particularly for intensive poultry and pig production. This also involves implementing best available techniques for livestock production. For details see table 3.

The code of good agricultural practice for ammonia abatement shall include provisions on nitrogen management in general (balanced N application), livestock feeding strategies (adapted, N-reduced feeding) and low emission techniques for manure storing, manure spreading and animal housing (table 4).
Mandatory Measures for Reduction of Ammonia Emissions

Application of manure and fertilisers i.a.

- low-emission slurry application techniques
  - 30% compared to broadcast spreading (where applicable)
- incorporation of solid manure 24 h after application
  - limited application for reasons of local soil conditions, manure type and farm structure possible

Animal housing and manure storage

- low-emission housing systems
  - 20% compared to reference system (e.g. fully slatted floor)
  - limited application for animal welfare reasons possible
- low-emission storage systems
  - 40% compared to open storage

Code of Good Agricultural Practice for Ammonia Abatement

The code shall include provisions on

- nitrogen management in general
  - balanced N application (e.g. avoid excess, application earliest in late winter or spring, assessment of N available for plants)
- livestock feeding strategies
  - adapted, N-reduced feeding
- low-emission techniques
  - manure spreading (e.g. injectors, band spreaders, incorporation, time of application, dilution, separation)
  - manure storage (e.g. sufficient storing capacity, reduced surface area, covers)
  - animal housing (e.g. partly slatted floors, large group housing, frequent manure removal, natural ventilation,....)
2.3 Reduction of nitrate pollution [1, 5, 6]


The objectives of the Directive are twofold (table 5):

- to reduce water pollution caused or induced by surplus nitrogen from agricultural sources (i.e. application and storage of inorganic fertiliser and manure on farmland) and
- to prevent further pollution of this type both to safeguard drinking water supplies, especially to meet the standards of Directives concerning the quality of drinking water \((\text{NO}_3 < 50 \text{ mg/m}^3)\) and to prevent wider ecological damage in the form of the eutrophication of freshwater and marine waters.

Table 5

**Reduction of Nitrate Pollution**


**Objectives**

- to reduce water pollution caused nitrogen and
- to prevent further pollution both
  - to safeguard drinking water supplies
    - to meet standards of Directives concerning the quality of drinking water: \(\text{NO}_3 < 50 \text{ mg/m}^3\)
  - to prevent eutrophication of freshwater and marine waters

**Measures**

- identifying / monitoring ‘water protecting areas’
- mandatory measures
- code of good agricultural practice

To this aim Member States must identify waters affected by nitrate pollution and waters which could be affected by such pollution and designate them and all known areas draining into those waters as ‘vulnerable zones’. In those zones is most conflict between arable and livestock production and the need for nitrate-free human water supplies.

For ‘vulnerable zones’ Member States must then establish and implement action programmes to reduce and monitor the nitrate concentrations in groundwaters and surface waters as well as eutrophication in surface waters. In addition a code of good agricultural practice for the reduction of nitrate pollution in general should be introduced. The objective is to keep the nitrate concentration in drinking water supplies below a maximum allowable concentration (MAC) of 50 ppm by reducing the ‘residual nitrogen’, the amount of nitrate remaining in the soil and soil water after normal absorption by crops.
The action programmes mentioned above according to Annex III of the directive contain mandatory measures including (table 6)

- periods when the application of certain fertilisers is prohibited;
- regulations on the capacity of storage vessels for livestock manure; this capacity must exceed that required for storage throughout the longest period during which land application in the vulnerable zone is prohibited, except where it can be demonstrated to the competent authority that any quantity of manure in excess of the actual storage capacity will be disposed of in a manner which will not cause harm to the environment;
- the limitation of the land application of fertilisers, consistent with good agricultural practice and taking into account the characteristics of the vulnerable zone concerned, in particular soil conditions, soil type and slope, climatic conditions, rainfall and irrigation, land use and agricultural practices, including crop rotation systems and to be based on a balance between the foreseeable nitrogen requirements of the crops and the nitrogen supply to the crops from the soil and from fertilisation corresponding to the amount of nitrogen present in the soil, the supply of nitrogen through the net mineralization of the reserves of organic nitrogen in the soil, additions of nitrogen compounds from livestock manure, additions of nitrogen compounds from chemical and other fertilisers.

Table 6

Mandatory Measures to Reduce Nitrate Pollution

Measures include

- periods when the application of fertilisers is prohibited
  ➔ winter times, e.g. 6 months
- minimum storing capacity for livestock manure
  ➔ e.g. sufficient for 6 months, except non-polluting disposal or treatment - biogas, separation
- limitation of the application of fertilisers
  ➔ in dependence of soil conditions, type and slope, climatic conditions, rainfall, land use and agricultural practices (crop rotation systems) and
  ➔ to be based on a balance between the nitrogen requirements of the crops and the nitrogen supply to the crops

 ➔ Maximum amount of N applied to the land
  170 kg / (ha year)

These measures shall ensure that, for each farm or livestock unit, the amount of livestock manure applied to the land each year, including by the animals themselves, shall not exceed 170 kg N per hectare.

The codes of good farming practice, that have to be introduced into the vulnerable zones in order to keep the nitrates concentration below the MAC should taking account of conditions in the different regions of the Community and certain provisions covering the following items according Annex II of the directive (table 7):

- periods when the land application of fertiliser is inappropriate;
- the land application of fertiliser to steeply sloping ground;
• the land application of fertiliser to water-saturated, flooded, frozen or snow-covered ground;
• the conditions for land application of fertiliser near water courses;
• the capacity and construction of storage vessels for livestock manures, including measures to prevent water pollution by run-off and seepage into the groundwater and surface water of liquids containing livestock manures and effluents from stored plant materials such as silage;
• procedures for the land application, including rate and uniformity of spreading, of both chemical fertiliser and livestock manure, that will maintain nutrient losses to water at an acceptable level.

Table 7

**Code of Good Agricultural Practice to Reduce Nitrate Pollution**

**Code shall cover i.a.**

- periods when the application of fertiliser is inappropriate
- application of fertiliser on specific side conditions
  - steeply sloping ground, water-saturated, flooded, frozen or snow-covered ground, near water courses
- capacity and construction of storage vessels for livestock manure
  - to prevent water pollution by run-off and leakage into the groundwater
- procedures for the application
  - rate and uniformity of spreading
- land use management
  - e.g. crop rotation systems
- fertiliser plans and records on fertiliser use

Member States may also include in their code(s) of good agricultural practices the following items:

- land use management, including the use of crop rotation systems and the proportion of the land area devoted to permanent crops relative to annual tillage crops;
- the maintenance of a minimum quantity of vegetation cover during (rainy) periods that will take up the nitrogen from the soil that could otherwise cause nitrate pollution of water;
- the establishment of fertiliser plans on a farm-by-farm basis and the keeping of records on fertiliser use;
- the prevention of water pollution from run-off and the downward water movement beyond the reach of crop roots in irrigation systems.

When authorising livestock installations e.g. under the IPPC Directive the requirements of the Nitrates Directive should be taken into consideration.
2.4 Industrial Pollution Control and Risk Management [4 - 7, 10]

The purpose of the Integrated Pollution Prevention and Control Directive (96/61/EEC) (IPPC Directive) is to achieve integrated prevention and control of pollution arising from the activities listed in Annex I (table 8). According to No. 6.6. Annex I Installations for the intensive rearing of poultry or pigs with more than:

- 40 000 places for poultry
- 2 000 places for production pigs (over 30 kg), or
- 750 places for sows

are within the scope of the IPPC Directive.

Table 8

Legislation on Industrial Pollution Control


Objectives

*Integrated prevention and control of pollution means*

- prevention and
- reduction of emissions to air, water and soil, including measures concerning waste,

in order to achieve a high level of protection of the environment as a whole

Scope

Installations for the intensive rearing of poultry and pigs with more than

- 40 000 places for poultry
- 2 000 places for production of pigs (over 30 kg), or
- 750 places for sows

and associated activities (production chain)

Installations for the intensive rearing of pigs and poultry in Europe can contain a wide range of activities, that are regulated under the directive: Feed storage and preparation, feeding and feeding strategy, housings of animals, ventilation and manure removal of the housings, storage of liquid and solid manure, maintenance and cleaning of equipment, landspreading and waste (-water) treatment.

The directive lays down measures designed to prevent or, where that is not practicable, to reduce emissions in the air, water and land from the above mentioned activities, including measures concerning waste, in order to achieve a high level of protection of the environment taken as a whole, without prejudice to Directive on the Assessment of the Effects of Certain Public and Private Projects on the Environment (environmental impact assessment, see below) and other relevant Community provisions.

Member States shall ensure that no new installation is operated without a permit issued in accordance with the IPPC Directive and that existing installations operate in accordance with the requirements not later than eight years after the date on which this directive was brought into effect (2004). The permission is needed for operation, substantial change in operation and extension of intensive livestock installations. The public must have the opportunity to share the permitting process (table 9).
The competent authority shall grant a permit containing conditions guaranteeing that the installation complies with the requirements of this directive or, if it does not, shall refuse to grant the permit. All permits granted and modified permits must include details of the arrangements made for air, water and land protection as referred to in the IPPC Directive.

The primary tasks in relation to the issuing of licences/permits are:

- receiving applications for licences/permits and
- consideration of applications and granting of permits.

Table 9

### Preconditions for Operation of Livestock Installations

**Permission (public permitting process)**

- is needed for
  - operation,
  - substantial change in operation and
  - extension
- of intensive livestock installations

**Basic obligations for operation i.a.**

- to prevent pollution
  
  ➜ application of ‘Best Available Techniques’ (BAT)
- to prevent accidents and limit their consequences
- not to cause significant pollution
- to prevent or minimise waste production
- to reuse waste
- to use energy efficiently

Applications to the competent authority for a permit includes a description of the installation and its activities, the raw and auxiliary materials, other substances and the energy used in or generated by the installation, the sources of emissions from the installation, the conditions of the site of the installation, the nature and quantities of foreseeable emissions from the installation into each environmental medium as well as the identification of significant effects of the emissions on the environment, the proposed technology and other techniques for preventing or, where this is not possible, reducing emissions from the installation, where necessary, measures for the prevention and recovery of waste generated by the installation, measures planned to monitor emissions into the environment.

The key environmental issues in context to animal production may cover aspects of

- the amount of resources used, such as feed and bedding materials; water consumption (drinking and cleaning); energy used for heating, ventilation and the other technical equipment; cleansing and disinfectants;
- emissions into the air, especially of odour, ammonia, greenhouse gases, dust, noise and microbiological substances;
- emissions to soil, surface and groundwater such as nutrients and heavy metals (Cu, Zn);
- farm residues including manure, residuals of associated activities such as oil, disinfectants, medication, sludges from waste water treatment.
The granting of licences/permits will involve subsequent regulation of their operation. The licensing/permitting procedure shall guarantee that (table 9):

- all appropriate preventative measures against pollution are taken, in particular through the application of ‘Best Available Techniques’ (BAT);
- necessary measures are taken to prevent accidents and limit their consequences;
- necessary measures are taken upon the cessation of activities to avoid pollution risk and to return the site of operation to a satisfactory state;
- no significant pollution is caused;
- waste production is prevented or minimised;
- waste that is unavoidably produced is disposed of with minimal effect on the environment;
- energy is used efficiently;
- monitoring data indicate compliance with conditions including emission limit values (ELVs).

The basic technology requirement to be reflected in IPPC integrated permits is ‘Best Available Techniques’ (BAT), which is defined in the directive (Article 2(11)) as follows (table 10):

- ‘best available techniques’ shall mean the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole;
- ‘techniques’ shall include both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;
- ‘available’ techniques shall mean that they are developed on a scale which allows implementation in the relevant industrial sector under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator;
- ‘best’ shall mean most effective in achieving a high general level of protection of the environment as a whole.

The application of BAT requires significant input of technical resources and a high degree of support for both the regulator(s) and industry. Comprehensive advice and guidance notes are essential for effective implementation of the integrated pollution control regime. The European IPPC Bureau (EIPPC) in Seville is charged with producing BAT Reference Documents (BREFs) for each of the categories of industrial activities listed in Annex 1 of the directive. The BREFs will assist the regulatory authorities by describing reference techniques and reference levels for each sector (table 11).
Criteria for the Determination of ‘Best Available Technology (BAT)´

**Best techniques**
- low emissions to
  - air: NH₃, odour, N₂O, CH₄, dust, noise, ...
  - soil and water: no leakage, leakage control, tight construction
- efficiently use of
  - energy: for ventilation, heating, technical equipment and
  - raw materials: feeding stuff, bedding materials, cleansing and drinking water
- amount and quality of manure and waste
- animal welfare

**Available techniques**
- technical and economical application possible

**Techniques**
- design, construction, maintenance and operation
  - 'management' or 'good agricultural practise'

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Table 11

**BAT Reference Documents (BREFs)**

**Contents of BREF-Documents**
- General Information
  - structure, economics, legislation
- Applied Processes and Techniques (overview)
  - housing, manure storing and treatment, application to land
  - consumption and emission levels, environmental effects, cross-media effects
- Best Available Techniques (BAT)
  - working principle
  - system-specific parameters
  - consumption and emission levels
  - animal welfare
  - productivity data
  - applicability/functional safety/practical experiences
  - References
- Emerging Techniques
In determining BAT for intensive livestock farming, decisive criteria include – in addition to achievable emission limit values for odour, ammonia, greenhouse gases and air-borne dust – emissions to water and soil, the prudent management of energy and natural resources and the types and quantities of wastes generated. The concept of ‘techniques’ includes, in addition to the technology used, notably also the way in which a livestock management installation is maintained and operated (its ‘management’). The term ‘available’ presupposes an economically viable application in the agricultural sector.

The techniques used in the housing of pigs and poultry, including ancillary facilities and landspreading, are to be documented comprehensively and systematically. For this, special BAT datasheets have been drawn up as part of the German contribution to the European information exchange to produce BREFs. The datasheets describe and evaluate in qualitative and quantitative terms the different techniques. In addition techniques need to be assessed in terms of their suitability as pollution prevention and control techniques. This task presents considerable methodological problems. For this purpose, an assessment procedure has been developed [10].

2.5 **Environmental Impact Assessment [5 – 7]**

Environmental Impact Assessment (EIA) is a horizontal environmental legislation on various matters which cuts across different environmental subject areas, as opposed to regulations which apply to a specific sector, e.g. water or air. It is laid down in the Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC on the Assessment of the Effects of Certain Public and Private Projects on the Environment.

The directive sets out the requirements for undertaking environmental impact assessments before development consent is granted for public and private projects which are likely to have a significant impact on the environment. The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case the direct and indirect effects of a project on human beings, fauna and flora; soil, water, air, climate and the landscape; material assets and the cultural heritage; including the interaction between the factors mentioned.

Projects are classified in two groups: projects listed in Annex I are subject to compulsory EIA while for projects in Annex II, the assessment is discretionary. The application of EIA to Annex II projects shall be determined by the Member States either through a case-by-case examination or by setting thresholds and criteria for specific types of projects according to Annex III or by a mixture of the two methods.

According to Annex I EIA is mandatory for installations for the intensive rearing of poultry or pigs with more than

- 85 000 places for broilers, 60 000 places for hens;
- 3 000 places for production pigs (over 30 kg); or
- 900 places for sows.

According to Annex II in the agricultural sector “Intensive livestock installations (projects not included in Annex I)” among others may underlay EIA.

The criteria for selection of projects according to Annex II are:

1. Characteristics of projects (e.g. size and cumulation with other projects, use of natural resources, production of waste, pollution and nuisances).

2. Location of projects (e.g. environmental sensitivity of geographical areas likely to be affected by projects taking into account existing land use, relative abundance, quality and regenerative capacity of natural resources in the area, absorption capacity of the natural environment, paying particular attention to e.g. nature reserves and parks and areas classified or protected under Member States’ legislation; special protection areas designated by Member States pursuant to Directive 79/409/EEC (Wild Birds Directive) and 92/43/EEC (Habitats Directive).
3. Characteristics of the potential impact (e.g. extent of the impact (geographical area and size of the affected population), magnitude and complexity of the impact, probability of the impact, duration, frequency and reversibility of the impact.

The directive lays down the rules for the EIA procedure. It is important that authorities with environmental responsibilities and the public, including those in other Member States in case of projects with trans-boundary effects, are properly and timely informed and have the possibility to give their opinion. Finally, all these elements shall be taken into account in the final decision on the authorisation of the project and the public and the environmental authorities shall be informed of the decision and the results of the assessment process.

As part of the EIA the following information is needed and has to be worked out by the developers:

- Description of the project, including in particular descriptions of the physical characteristics of the whole project and the land-use requirements during the construction and operational phases, the main characteristics of the production processes, for instance, nature and quantity of the materials used, an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, etc.) resulting from the operation of the proposed project.

- An outline of the main alternatives studied by the developer and an indication of the main reasons for this choice, taking into account the environmental effects.

- A description of the aspects of the environment likely to be significantly affected by the proposed project, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors.

- A description of the likely significant effects of the proposed project on the environment resulting from the existence of the project, the emission of pollutants, the creation of nuisances and the elimination of waste, and the description by the developer of the forecasting methods used to assess the effects on the environment.

- A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.

- A non-technical summary of the information provided under the above headings.

- An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the developer in compiling the required information.

This description should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the project.

Several institutional models exist for handling EIA procedures in Member States. These range from options in which the central government department or ministry is appointed the competent authority for all permitting procedures, to one in which the majority of the responsibility is delegated to regional and local authorities. This second approach also makes arrangements for public consultation more practical as it brings the process closer to the main protagonists. The EIA procedures are integrated with the process for granting development consent. Some Member States have revised their permitting procedures to combine them into a single permitting procedure for both EIA and IPPC.

The implementation of the EIA Directive must be considered in conjunction with a number of other legal acts from the environmental sector. Key examples are the legislation concerning the authorisation and operation of installations (Integrated Pollution Prevention and Control Directive (96/61/EEC) and legislation concerning the protection of habitats and species. One of the triggers for requiring an EIA is where sites of value to wildlife are potentially affected according to the Wild Birds Directive (79/409/EEC) and the Habitats Directive (92/43/EEC).
3 Conclusions

European environmental legislation has an increasing influence on the legislation in the Member States and on the agricultural sector and the actors in it. Even the Common Agricultural Policy contributes to this development and focuses on the protection of the environment and the development of the natural potential of the countryside.

Intensive livestock farms and activities associated are a significant source of different emissions into air, soil and water and have the potential, if not properly managed and controlled, to lead to deterioration in the environment and to cause environmental pollution. Thus environmental legislation with respect to agriculture is chiefly concerned with limiting pollution by introducing minimum standards for e.g. the management of livestock installations and the spreading of manure, notably in order to reduce water and air pollution.

Emission-related legislation with respect to agriculture is focused on the prevention and reduction of nitrogen emissions into air (UN-ECE Protocol and NEC Directive) and soil and water (Nitrates Directive). The different directives are based on each other (table 12). This is obvious for instance in the field of water protection where water quality standards e.g. of the drinking water directive are the basis for the regulations in the Nitrates Directive.

For these ‘sectoral’ approaches are not sufficient a ‘horizontal’ and integrated Community approach which takes account of all types (emission to air, soil and water) and causes of pollution (industry, energy, transport, agriculture, etc.) including cross-media effects was developed in the last years. The directives on Environmental Impact Assessment (EIA) and on Integrated Pollution Prevention Control (IPPC) represent this approach.

Table 12

Interaction of Environmental Legislation

<table>
<thead>
<tr>
<th>UN/ECE Convention</th>
<th>NEC Directive</th>
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<tbody>
<tr>
<td>IPPC Directive</td>
<td>Nitrates Directive</td>
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**Animal housings**
- low emission housing (e.g. adapted feeding, natural ventilation, partly slatted floors, sufficient bedding, frequent manure removal)
- thermal insulation
- energy saving fans
- Good Agric. Practice

**Storing of manure**
- covered storing tanks (e.g. straw, clay pellets)
- sufficient storing capacity
- construction to prevent leakage
- leakage control measures
- Good Agric. Practice

**Application of manure**
- low emission application (e.g. band spreaders, incorporation of solid manure within 24 h)
- fertiliser plans and records
- monitoring of nutrients in soil
- Good Agric. Practice

Measures necessary to enforce the reduction targets of the directives mentioned above in practice can be implemented by the way of permitting/licensing procedures according to the IPPC and EIA Directives. The determination of BAT in intensive livestock farming is crucial for this attempt. BAT include minimum standards for the construction and operation of low emission housings and storing facilities and for the application of manures on farmland. Under IPPC additional requirements such as an efficient use of energy and raw materials...
have to be taken into consideration. The description of good agricultural practice for all activities related to livestock farming is a mean to support the technical based BAT standards by operational requirements.

Both the IPPC and the EIA Directives are very important for existing and new livestock farms and their development. EIA ensures by procedural regulations that in the case of certain livestock installations that might have severe effects on the environment these effects are surveyed and taken into account when deciding on approval. In rural areas regulations on nature protection as laid down in the Wild Bird and Habitats Directives may be crucial. Whereas the IPPC Directive is the base of an integrated environmental protection taking cross-media effects and the whole production chain (feeding, housing, manure removal, manure storage and treatment and manure spreading) into account.

Not all installations within the scope of the IPPC Directive require an environmental impact assessment. However IPPC Directive states that the application of IPPC is to be without prejudice to EIA Directive. In other words the requirements of the EIA Directive must still be met, even if an activity is also subject to IPPC. Moreover, any relevant information obtained under the EIA process has to be taken into account in IPPC permitting procedure.

The directives mentioned above in addition to other international regulations will risen the level of environmental protection in agricultural production as a whole. Their implementation and enforcement in the Member States of the European Union is essential for harmonising the competitive situation in Europe.
References


