European Union Network for the Implementation and Enforcement of Environmental Law

Good practice for tackling diffuse nitrate pollution from farms & farmsteads

A guidance document with examples of good practice

IMPEL Diffuse Pollution Network 2015

INTRODUCTION TO THIS DOCUMENT

This document collates examples of good practice for tackling diffuse nitrate pollution from farms & farmsteads.

The purpose of the document is to present pragmatic methods which can contribute to limit nitrate leaching to the aquatic environment and thereby contribute to a higher level of compliance with the aims of the Nitrates Directive and Water Framework Directive.

According to the Nitrates Directive the member state must establish codes of good agricultural practice, to be implemented by farmers as mentioned in Annex II and III. The codes of good practice are implemented as a number of specific obligations for the farmer and can differ from member state to member state. It is the intention with this document to describe in more detail than has been done previously how those obligations can be controlled and in the end help each member state to be in compliance with the directive.

The Nitrates Directive forms an integral part of the Water Framework Directive and is one of the key instruments in the protection of waters against agricultural pressures. This work will therefore include measures implementing both EU-directives.

The document does not offer a complete overview of good practice for controlling the various measures. It is intended as a helpful tool which can be expanded over time through IMPEL's Diffuse Pollution Network.

The document is partially built on the EU commissions report from 2011, "Controls on the implementation of the Nitrate Directive. Results of a questionnaire among Member States. Guidelines on Controls" (appendix 1) with the aim of making the recommendations from the report even more concrete by giving practical examples of good practice for controlling various measures. The examples can be from one member state or they can be a compilation of practice from more member states.

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

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1. BACKGROUND

The European Commission identified the area of diffuse pollution as a priority to IMPEL during a joint meeting in Brussels on 14/09/12. They highlighted that there are poor levels of compliance with the Water Framework Directive (diffuse pollution & illegal abstraction) and the Nitrates Directive and that a gap has been identified between "environmental" and "agricultural" inspectorates. As a result they wished to see how enhanced networking of different regulatory agencies could be carried out to achieve higher levels of compliance in the agricultural sector through the exchange of relevant information and current best practice for control of diffuse pollution.

During 2013 an initial IMPEL project on the topic of diffuse pollution was carried through to establish networks between agricultural and environmental regulatory experts and inspectors in the field of diffuse pollution and the Nitrates Directive. Two field visits were held looking at the two primary topic areas. Members of the project identified that they wished to continue work in this area through the development of more exchange visits and through the development of a guidance document to share good practice identified in this area to aid implementation.

The first visit was held in Holbæk in Denmark and was designed to study how the Nitrates Directive is implemented in Denmark and how measures of the Directive are controlled. The second visit was based in Edinburgh, Scotland and looked at agricultural diffuse pollution as regulated by the Water Framework Directive.

The 2013 project was followed up by the 2014 project "Sharing good practice in tackling diffuse pollution and nitrate loss from farms & farmsteads", with one of the desired outcomes to be the drafting of this good practice document.

A follow up project is planned for 2016 with the aim of expanding the good practice document with additional examples and to plan for future activities in the Diffuse Pollution Network to ensure the maintenance of the good practice document and the distribution of its information in a clear and readily accessible way.

2. MEASURES OF THE NITRATES DIRECTIVE

The Nitrates Directive aims at reducing water pollution caused or induced by nitrates from agricultural sources and, further, at preventing such pollution.

Article 4 of the Nitrates Directive states that Member States shall establish codes of good agricultural practice, to be implemented by farmers on a voluntary basis, which should contain provisions covering at least the items mentioned in Annex II A.

Furthermore Article 5 of the Nitrates Directive states that Member States shall establish action programmes in the designated vulnerable zones. The action programmes consist of the measures in Annex III, and also those measures which Member States have prescribed in the code(s) of good agricultural practice, except those which have been superseded by the measures in Annex III.

In the individual Member States, the provisions on control on the correct implementation of these measures are included in the legal texts of the act implementing the Nitrates Directive, or in other relevant acts.

As yet the guidance document covers these Nitrates Directive measures:

- Capacity of manure storage
- Construction of manure storage
- Balanced fertilization

The chapters on those measures are based on the European Commission's report from 2011, "Controls on the implementation of the Nitrate Directive. Results of a questionnaire among Member States. Guidelines on Controls". The objective is to make the recommendations from the report even more concrete by giving practical examples of good practice for controlling the various measures. The examples can be from one member state or they can be a compilation of practice from more member states.

2.1 CAPACITY OF MANURE STORAGE

FORMAL DESCRIPTION

This measure is described in the Nitrates Directives annexes II and III as follows:

Annex II-A.5. 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.

Annex III-1.2. 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.

BACKGROUND

During periods in which it is not allowed to apply manure, the manure has to be stored. The storage capacity should be sufficient at least to store all manure produced during the closed period, considering the risk linked to unpredictable climatic events. The following information is needed to assess the minimum required storage capacity:

- The number of livestock and excretion of manure and urine, for each type of livestock
- The use of cleaning and drinking water and bedding materials, for each type of livestock, housing system and manure storage system
- The supply of surface water from paved areas if the supply drains to storage
- The changes in volume because of evaporation, mechanical treatment of storage, and degradation and composting processes
- The closed period, i.e. the period in which it is not allowed applying manure. The storage capacity should be larger than the manure production during the closed period, because the closed period should be extended if wet conditions or frost prohibits application of manure.

Also, capacity should ideally be adjusted so to calibrate manure application in periods of the year when it's efficiency can be maximized.

CONTROL OF MANURE STORAGE

On-the-spot control of capacity of manure storage

Measuring the storage vessel

The capacity of storage vessels for livestock manures can reliably be controlled through a measurement on site. This is fairly easy for freestanding storages as they are accessible for a check of length, width,

circumference (or diameter) and height. Storages which are an integrated part of animal housing are more difficult to measure. In the case of slatted floors, special measuring sticks can help to assess the depth. For safety reasons, some underground closed storages are not accessible for detailed measurements.

Indirect control of capacity of manure storage

Estimation of manure production

An important but uncertain part of this control is the estimation of manure production. The actual number and type of livestock can be counted on the premises. However, animal registers will have to be consulted to check the average number and type of animals during the housed period. The manure production per animal has to be calculated from available standards on manure excretion, which, for legal certainty, should be clearly indicated in the action programmes.

Following the calculation of manure production, the measured storage capacity can be assessed against the required period to bridge the closed period for manure application, considering the additional capacity to prevent application in periods when it is not possible (e.g. wet conditions or frost outside closed periods), and the minimum capacity for manure storage, expressed in months, which should be clearly indicated in the action programme.

Import and export of manure

If the actual storage capacity on a farm is not sufficient, there should be written proof of rented manure storage elsewhere, or, if the livestock manure is transferred to another holding, to a biogas plant, the transfer must be documented by a manure contract signed by the receiver.

EXAMPLES OF GOOD PRACTICE FOR CONTROLLING CAPACITY OF MANURE STORAGE

Using a standard form for calculating the capacity

The capacity of storage can be calculated by a *standard form*.

The farmer is held responsible for submitting an updated calculation of storage capacity to the controlling authority, when changes are made that influence the capacity.

In addition, the capacity is calculated automatically after an inspection when the inspector enters information from the inspection in the municipality's casework system.

The standard form

Supply is calculated as the quantity of livestock manure produced during the period in question on the basis of the animals being stabled, together with quantities otherwise supplied to the facility, including washing water and silage effluent.

An example of a standard form for calculating the capacity, used in Denmark, is seen in appendix 2. In appendix 3 part of the original standard form is simplified and translated into English to give a very basic illustration of how it works.

The standard form essentially is a set of forms calculating:

- The volume of manure ex storage
- Correction for volume of residue water from the livestock production and rainwater
- Produced volume of manure per month
- Sufficient capacity of manure storage

The volume of manure is calculated on basis of standard values. The standard values for manure volume vary with animal species, breed, age, weight etc. The standard values for manure volume cover the various types of manure, such as slurry, deep litter etc.

2.2 CONSTRUCTION OF MANURE STORAGE

FORMAL DESCRIPTION

This measure is described in the Nitrates Directives annexes II and III as follows:

Annex II-A.5. 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.

BACKGROUND

During periods in which it is not allowed to apply manure, the manure has to be stored. The construction of the manure storage should be evaluated, because the manure should be stored without leaching of nitrogen and phosphorus to ground water and surface water.

CONTROL OF THE CONSTRUCTION OF MANURE STORAGE

On-the-spot control of the construction of manure storage

Where minimum distances to surface water bodies have been defined in the action programme, these can be verified through direct measurement. The only reliable method to verify that the construction meets the requirements is an on-site check. Clearly visible defects, such as splits or large leakages, are easy to spot. However, minor leakages or cracks in the floor can only be assessed indirectly through traces of nearby soil and water pollution. Cables can be checked for corrosion. Inspection of the foundation requires excavation along the sides for inspection of leaks and cracks. If storages are empty, leak tests under high pressure can be performed. The control performed with remote sensing devices and interpretation of aerial orthophotographs and satellite data can detect sites of manure and slurry discharge and focus the on-the-spot control on risk zones.

Indirect control of the construction of manure storage

It is essential that the planned design and construction of manure or silage storages is laid down in permits or other formal documents. These will have to be part of the documents to be checked. Sampling of water bodies nearby the vessel could be a useful element for control of leaks. However, it can be difficult to prove that the discharges originated from the storage and not from some other sources.

EXAMPLES OF GOOD PRACTICE FOR CONTROLLING CONSTRUCTION OF MANURE STORAGE

Authorised inspection scheme for slurry tanks

This is an example from Danish legislation, where an authorised inspection scheme is used to create a technically sufficient basis for the local council's decision on whether slurry tanks comply with the Danish general binding rules (appendix 4) for the construction of slurry tanks.

General binding rules for the construction of slurry tanks

According to the Danish general binding rules, slurry tanks shall be made of durable materials that are impermeable to moisture, and slurry tanks shall be appropriately dimensioned in relation to capacity to resist the impacts of stirring, covering and emptying. The local council shall order remedial measures, or possibly forbid operation of a slurry tank, if it finds a likely risk of a tank cracking, rupturing or similar. Stricter rules apply when a slurry tank is located where malfunctions or accidents may entail serious damage to water supply facilities, watercourses, lakes larger than 100 m² or coastal waters.

Regular control by technically authorized inspector is required

All slurry tanks with a capacity of 100 m^3 or more shall be inspected at least every 10th year (every 5th year for slurry tanks close to watercourses or lakes). The inspection shall be carried out by an authorized inspector. At the inspection the slurry tank's strength and leak-tightness is estimated, as the focus is to ensure the maintenance of the tank.

The inspection of the slurry tank

The inspection consists of an evaluation on the tank´s tightness and strength. The result of the inspection is an evaluation sheet stating one of the following options:

1. There is no need for repair
2. There is a need for specified maintenance/repair. A compliance date is given
3. The slurry tank does not meet the requirements for strength and tightness and is not allowed to be used for storing manure

The evaluation sheet is sent to the local council, and it is the local council's responsibility to ensure that the farmer repairs the slurry tank or stops using the slurry tank, if this is the outcome of the inspection.

The farmer is responsible for completion of the control in due time

The farmer makes the appointment with the inspector and pays about DKK 3,500 (approximately € 500) for the inspection. The farmer's insurance for the slurry tank will normally demand, that the mandatory control of slurry tanks has been completed in due time, which gives additional certainty of compliance with the rules.

2.3 BALANCED FERTILIZATION

FORMAL DESCRIPTION

This measure is described in the Nitrates Directives annex III as follows:

Nitrates directive, Annex III-1.3. limitation of the land application of fertilizers, consistent with good agricultural practice and taking into account the characteristics of the vulnerable zone concerned, in particular: (a) soil conditions, soil type and slope; (b) climatic conditions, rainfall and irrigation; (c) land use and agricultural practices, including crop rotation systems; and to be based on a balance between: (i) the foreseeable nitrogen requirements of the crops and (ii) the nitrogen supply to the crops from the soil and from fertilization corresponding to:

- The amount of nitrogen present in the soil at the moment when the crop starts to use it to a significant degree (outstanding amounts at the end of winter),
- 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 fertilizers.

BACKGROUND

This measure contains several aspects of the fertilizer use, including the so called balanced nitrogen fertilization. This is an important measure as it largely affects the nitrogen inputs to agricultural soils, aiming at achieving a balance between inputs and outputs of nitrogen, which minimizes the risk of nitrate leaching.

For assessment of nitrogen application standards the following information is needed:

- The crop yield and content in the considered region in order to estimate the crop demand for nitrogen
- Addition of nitrogen from other sources than fertilizer and manure, i.e. atmospheric deposition, biological nitrogen fixation, mineralization of soil organic matter and crop residues
- The type and composition and application methods of fertilizers and manure, including the manure nitrogen efficiency factor, which is needed to estimate the amount of plant-available nitrogen in manure. Also the nitrogen input by grazing must be included.
- Soil type and climatic conditions
- Possibility for irrigation, which is needed to obtain certain yields in dry areas
- Besides the nitrogen inputs and outputs by fertilizers and manures also the phosphorus inputs and outputs should be assessed in order to calculate the phosphorus balance. The surplus of phosphorus

on the balance in combination with information about soil type, the phosphorus status and weather conditions are used to estimate the risk of phosphorus leaching and run off.

The easier possibility is to establish maximum application standards (both for mineral and organic fertilizers) for all crops cultivated in Nitrate Vulnerable Zones (NVZ), taking into account average yields and crop needs.

CONTROL OF BALANCED FERTILIZATION

On-the-spot control of balanced fertilization

Verification of this measure is mainly a document check, but a visual inspection could include a check on crops growing in fields, and counting of animals, and a check on available fertilizers and manures.

Indirect control of balanced fertilization

The limitation of land application of fertilizers, consistent with good agricultural practice and environmental considerations, requires a balance between crop requirements and nitrogen supply through fertilizer, manure, crop residues, biological fixation, mineralization and atmospheric deposition. To ensure a reliable control several parameters must be consulted.

For an annual whole farm approach, the required information for controlling balanced fertilization is listed below.

1. Total agricultural area, and area per crop
2. Total amount of nitrogen allowed on the farm, calculated on the basis of nitrogen standard application rates for crops
3. Area allowed to be fertilized with manure
4. Total consumption of manure, including imported and excluding exported manure, stock changes
5. Type of manure applied , including inorganic (plant available) and total nitrogen contents
6. Consumption of chemical fertilizer nitrogen, taking into account changes in stocks

EXAMPLES OF GOOD PRACTICE FOR CONTROLLING BALANCED FERTILIZATION

Fertilizer account

In this example the description of the information listed above is focused on the use of fertilizer accounts for the control, but the list of required information will be similar for other methods of controlling balanced fertilization.

With a fertilizer account for each farm the balanced fertilization can be controlled by holding up the nitrogen consumption throughout a year against a nitrogen quota allocated to that particular farm.

The account includes 1) the amount of nitrogen in manure or chemical fertilizer bought, produced or received and 2) the amount of nitrogen sold, stored or transferred to another farm. The difference between the two is recorded as nitrogen used in the fields, and this amount must not exceed the farm's nitrogen quota.

To ensure that the correct amount of chemical fertilizer is accounted, preferably a national register should be established. Businesses or persons selling fertilizers (including plants for manure processing) can be obliged to report the sale stated as kg N. Information about purchased fertilizer and received manure (including processed manure) could be preprinted in the fertilizer account by the controlling authority.

If the farm holding has applied for single payment, information about agricultural land could be preprinted in the fertilizer account by the controlling authority as well.

1. Total agricultural area, and area per crop

The total area owned or leased by the farmer for agricultural production, including set-aside.

2. Total amount of nitrogen allowed on the farm, calculated on the basis of nitrogen standard application rates for crops

The yearly amount of nitrogen fertilizer permitted (nitrogen quota) on a farm is calculated taking into account the characteristics of the area and is based on a balance between the foreseeable nitrogen requirement of the crops and the nitrogen supply to the crops from the soil and from fertilization.

Nitrogen application standards

The optimal relationship between the nitrogen requirements of the crops and nitrogen supply should be estimated on basis of trials for representative soil types and for irrigated soil. Additionally, the relationship between prices of nitrogen and crops could be taken into account, thus basing the application standard rates on economically optimal nitrogen application rates.

3. Area allowed to be fertilized with manure

The area allowed to be fertilized with manure includes fields with a cultivated crop that has a nitrogen or phosphorus standard application rate.

The following areas are not included: Forest land (except for areas with greenery and christmas trees, as well as areas with new plantings), areas where livestock manure can not normally be applied (e.g. slopes and hills, moorland, wet meadows and the like) or areas on which application of manure is not allowed (e.g. set-aside land and buffer strips) or only allowed the amount of nitrogen from animals grazing.

4. Total consumption of manure, including imported and excluding exported manure, stock changes

The consumption of nitrogen in manure for fertilizing the fields of a certain farm or holding in a specific year can be calculated as follows:

Consumption of manure = Opening stock of manure + norm production of manure + imported manure – exported manure – closing stock of manure

Opening stock of manure is the amount of manure nitrogen in storage at the beginning of the year

A *norm production of manure* can be calculated based on information of the *number of animals* multiplied with *standard values* for the nitrogen amount *ex storage.*

Imported manure is the amount of manure supplied to the farm, not produced by the farms own animals.

Exported manure is the amount of manure produced on the farm by own animals, transferred to be applied on the fields of another farm/other farms.

Closing stock of manure is the amount of manure in storage at the end of the year

How to determine the number of animals on the holding

Table 2.3.1 shows how the yearly animal stock can be estimated. The information could be production records of the animal production, purchase invoices for feed, sales and buying invoices for animals, slaughterhouse accounts etc. Data on the number of animals are also available otherwise for e.g. cattle where the farmer has submitted the data for other purposes, e.g. to the National Central Husbandry Register.

Dairy cows and breeding	1 yearling cow or breeding = 365 feed days per year
Sows	1 yearling sow (incl. it's piglets) = 365 feed days per year
Piglets, x-xx kg	Number produced per year
Production pigs, xx-xxx kg	Number produced per year
Broiler chickens	Number produced per year
Hens	1 yearling hen = 365 feed days per year
Sheep	Numbers in one year as an average
Goats	Numbers in one year as an average
Horses	Numbers in one year as an average

Table 2.3.1. Determining the number of animals to be multiplied with the standard values.

How to determine the standard values

The standard value for each type of animal depends, as a starting point, on the housing system due to the various types of manure produced in the various housing systems. Thus a certain standard value can be determined for each combination of animal type and housing system. The standard values for nutrient content in manure are calculated at three points (1) *ex animal*, (2) *ex housing* and (3) *ex storage*.

Calculation of standard values *ex animal* is done as a simple difference between input and output. Input is founded on recordings and calculations of feed intake for the different categories of animals combined with knowledge of nutrient concentrations in the diets. The nutrient retention in the animal is calculated based on standard values. The excretion separated into faecal and urinary fractions is also calculated using the digestibility coefficients of the different nutrients.

Calculation of nutrient content *ex housing* includes subtraction of nitrogen lost due to emissions for each type of housing system. Hereafter the contribution of nutrients from bedding materials are added and the soaking of urine into the bedding materials and faeces is calculated in order to establish values for slurry (faeces and urine together) and separately for faeces (manure or deep litter) and urine (liquid manure).

Based on ex housing standards, the final step – *ex storage* - takes into consideration what happens while the different manures are stored. Losses of N (due to emissions) and dry matter are subtracted. Furthermore, redistributed nutrients, dry matter and liquid due to leakage of juice from faeces etc. are included in the model.

Standard values are calculated for all major livestock types and relevant housing systems and manure types. The data for calculating the standard values could be based on collated information on actual average practice from a number of representative farms. This information could come from feeding plans or national feed controlling systems in combination with production results, where feed utilization and nutrient excretion can be calculated from data on the amount and composition of used feedstuff and farm products sold.

For meat producing livestock, such as beef calf, production pigs and broilers, it has shown useful to define the standard values for a certain number of produced livestock, as the amount of sold meat can be controlled for both weight and numbers, in the farms tax account or from the balance from the slaughterhouse.

For each country it can be necessary to set a minor limit for farms (small) to be obligated to calculate manure standards. It could be chosen to have a set of manure standards for minor farms, which do not change every year.

An example of determination of standard values for nitrogen ex storage can be found in the Danish normative system, as described on this website http://anis.au.dk/forskning/sektioner/husdyrernaering-og-miljoe/normtal/ (Institute of Agricultural Sciences, University of Aarhus). A list of the Danish standard values can also be found on the website.

An example of calculating total yearly consumption of manure

Table 2.3.2 below shows an example of calculating the total yearly consumption of manure.

Stock on 1 August 2014		*1050 Kg N*
Norm production 1 August 2014 to 31 July 2015		+8956 Kg N
Import of manure		+ 2030 kg N
Export of manure		-1050 kg N
Manure exported to another country		0
Manure by livestock grazing areas not allowed to fertilize		-350 kg N
Stock status on 31 July 2015	1020 Kg N	
Consumption from 1 August 2015 to 30 September 2015 to crop harvested before 31 December 2015	-560 Kg N	
Estimated closing stock on 31 July 2015	= 460 Kg N	-460 Kg N
Consumption of kg of nitrogen in manure in 2014/15		= 9538 Kg N

Table 2.3.2. Example of calculating total yearly consumption of manure. Consumption of nitrogen in manure and processed manure is stated in kg nitrogen.

5. Type of manure applied, including inorganic (plant available) and total nitrogen contents

Only part of the nitrogen in manure is effectively utilized by the crop. Therefore the total amount to be included in the fertilizer account does not equal the total consumption of nitrogen in manure.

The total amount to be included in the account is calculated by multiplying the *efficiency percentage* (efficiency rate) for the particular type of manure by the total amount of nitrogen in the manure.

Degassed biomass (degassed manure) from biogas plant

The input and output material to a biogas plant is difficult to control because of the variation of the input materials other than manure. It is therefore difficult to determine the nutrient content. In the end it makes it difficult to determine the amount of nitrogen applied to the field.

Several solutions to control the nitrogen content of input and output material:

- Laboratory analyses of input and output
- Setting a fixed percentage of efficiency by law
- Biogas plant calculating the content
- Specified list with efficiency for organic waste in the end product
- For manure output equal to nitrogen input (standard norms)
- Plant biomass is estimated to 80 % of nitrogen input (standard norms)

6. Consumption of chemical fertilizer nitrogen, taking into account changes in stocks

If the farmer uses chemical fertilizer, the entire content of nitrogen must be included in the account. A start and end stock must be adjusted. If possible the information of purchased chemical fertilizer must be preprinted in fertilizer accounts.

3. MEASURES TO MITIGATE DIFFUSE POLLUTION IN GENERAL

This chapter presents practical measures to help deliver the objectives outlined in River Basin Management Plans required in the Water Framework Directive.

3.1 PRIORITY CATCHMENT APPROACH TO MITIGATE DIFFUSE POLLUTION

With this approach activities are targeted towards selected catchments which are downgraded as a consequence of rural diffuse pollution. In these catchments sources of diffuse pollution are identified and the pressures found mapped. It can give an understanding of the diffuse pollution pressures in the catchment and also provide an evidence base for awareness raising in how land use activities can impact on water quality. In this manner the time consuming activities of detecting and mitigating sources of diffuse pollution are targeted towards highly prioritized areas.

EXPERIENCES FROM SCOTLAND

The approach as reported in this document has been employed by the Scottish Environment Protection Agency (SEPA). The general description of the priority catchment approach is supplemented with case descriptions of SEPA's experiences.

Achieving compliance with the Scottish diffuse pollution general binding rules (GBR) introduced in 2008 is an important part of SEPA's priority catchment work. These rules focus on land and water run-off management. They are based on existing codes of good practice. As such, most land managers should already comply. The diffuse pollution general binding rules cover a range of activities, such as storage and application of fertilizer, keeping of livestock and cultivation of land with the purpose of reducing the risk of diffuse pollution from rural land use activities and contributing to protect and improve water quality.

DESCRIPTION OF THE PRIORITY CATCHMENT APPROACH

This approach has three phases, which are undertaken in each priority catchment:

1. Desk based study, catchment walks and ongoing monitoring
2. Awareness raising
3. One to one visits with land managers providing advice on solutions and then revisits

Phase 1: Desk based study, catchment walks and ongoing monitoring

The purpose of this first phase is gathering evidence and detecting specific pressures within the catchment. The first step is a *desk based study* gathering the relevant information already at hand. This could be looking at current and historic water quality information (chemical and ecological), for any trends in recent water pollution events from farms, land use information and farming types. This information is used to identify downgraded waterbodies within the catchment for possible interventions.

The next step is the *catchment walk*. The main purpose of these walks is to gather physical evidence of the pressures within the catchment. This information is then used on a GIS layer and overlaid on waterbodies in the catchment to see the extent of issues in relation to downgraded waterbodies, attempting at this stage to identify the area of operation for proactive visits to land owners. The information is preferably logged onto hand held computers which are GPS enabled.

Figure 3.1.1 shows an illustration of mapped breaches detected through catchment walk in the Scottish catchment of Eye Water and Pease Bay.

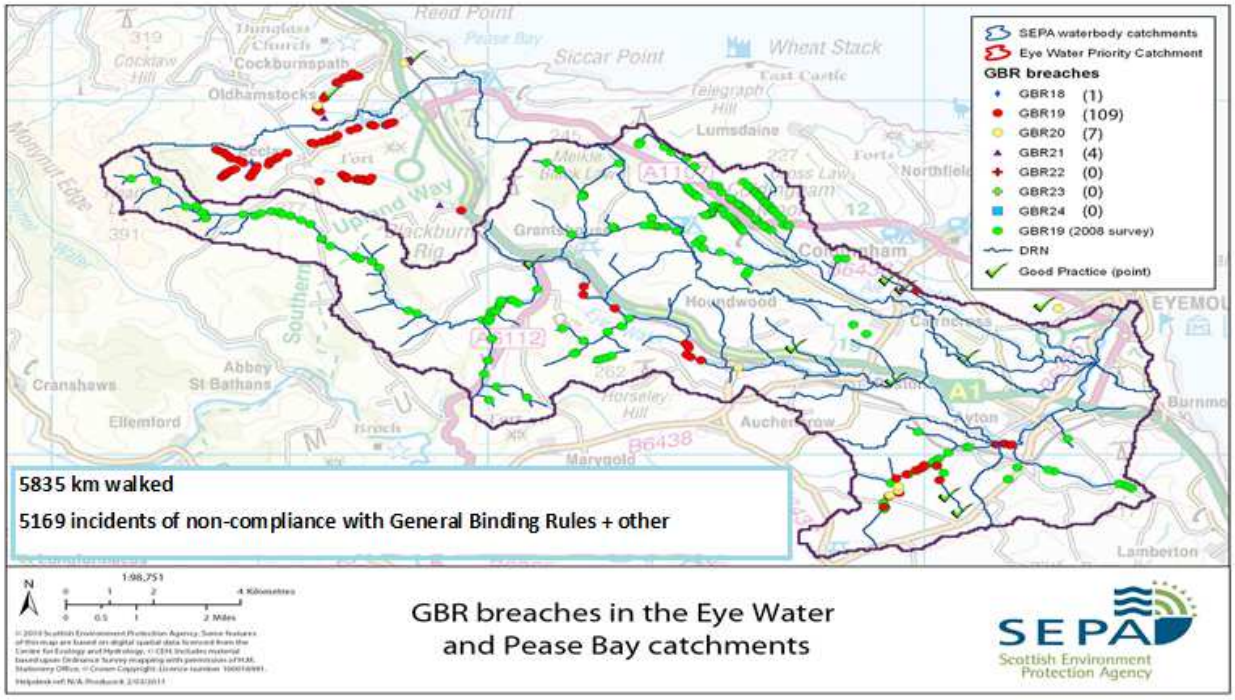

Figure 3.1.1. Breaches of general binding rules detected through catchment walk in the Scottish catchment of Eye Water and Pease Bay.

From the beginning of the catchment work longterm *ongoing monitoring* should be done to detect changes in water quality as a result of land managers becoming compliant.

EXPERIENCES FROM SCOTLAND (PHASE 1)

Diffuse pollution priority catchments were identified by SEPA as catchments failing to meet environmental standards. Fourteen priority catchments, containing some of Scotland's most important waters (for conservation, drinking water, bathing and fishing), have been selected using a risk based approach for action in the first basin planning cycle.

SEPA appointed dedicated priority catchment coordinators to investigate the issues each catchment faces and liaise with local land managers to implement the measures.

SEPA is currently in the final stages of completing the work in all 14 catchments, all walks and initial one to one visits have been completed, leaving awareness raising to continue and follow up visits to non compliant farms.

Catchment walks and recordings of non compliances

An inspector is allocated around 8 km of watercourse to walk in the day. The inspectors are asked to collect information in relation to non compliances with the Scottish General Binding Rules (regulation), point source pollution problems, Non Native species as well as evidence of good practice (buffer zones, fencing and riparian woodland).

Only named watercourses on a 1:50,000 ordnance survey map were walked. So at this initial stage not all watercourses in the catchment were walked, but only the main stems of named water course. As staff undertook the walk they recorded good and bad (non compliance) practices. This information was logged onto the hand held computers they carried, which are GPS enabled. The point where the issue was found is marked on the screen. The inspector can then allocate what is found from drop down boxes on the screen. A National Grid reference is allocated to the issue and the inspector then takes a picture with computer and move on. The use of these portal hand held computers automatically digitizes the information when downloaded to the SEPA system and is illustrated as per figure 3.1.1 above.

In Scotland's 14 priority catchments, over 5,835 km of watercourse was walked and 5,169 non compliances with the Scottish Diffuse Pollution General Binding Rules were recorded – approximately 1 non compliance with regulation for every 1 km walked.

Most frequent non compliances

The main diffuse pollution issues related to the keeping of livestock, with around 75 % of the non compliances identified at farm visits associated with significant livestock poaching within 5 metres of the water environment. These incidents concerned livestock access to watercourses (primarily associated with fenced in-stream watering points, shelter/shade and cross points), causing faecal contamination of the watercourses and erosion or poaching of land. Around 20 % of land was being cultivated within 2 metres of top of bank (buffer strips).

Longterm monitoring in target catchments

Each priority catchment has a target catchment which has been identified as only being impacted by rural diffuse pollution. These small catchments have no other external diffuse pollution sources, no septic tanks, no impact from rural roads or sewage treatment works. Within these areas SEPA is monitoring longterm to see if changes in water quality can be detected as a result of land managers becoming compliant and farming in line with Scotland's General Binding Rules.

Phase 2: Awareness raising

This phase implies general communication with stakeholders. This could involve workshops and evening meetings. These events look at the issues identified in the catchment during the walking phase of the plan. Other methods of awareness raising can also be done via press releases, articles in journals, TV and radio.

Part of the awareness raising is to convey the message to the farmers, that compliance does not only benefit the environment, but benefits the farmers as well, e.g. from better soil quality and reducing the risk of erosion, as faecal nutrients and soil will remain on the farm.

At meetings possible options to address diffuse pollution problems can be discussed as well as help to develop practical steps to improve the condition of the water environment in the catchment.

EXPERIENCES FROM SCOTLAND (PHASE 2)

As part of the priority catchment work, there was a range of evening meetings, workshops and site visits to help land managers understand the steps needed to protect water quality and develop cost effective solutions to reduce risks.

Involving stakeholders

Work to address the environmental problems identified was undertaken by SEPA together with National Farmers Union Scotland (NFUS), Scottish Rural Property and Business Association (SRPBA), Scottish Tennant Farmers Association (STFA), Confederation of Forest Industries (ConFor), Scotland's Environmental and Rural Services (SEARS) partners, and land managers in each diffuse pollution catchment.

In order to get buy in from all stakeholders who either work, regulate or provide advice in the rural sector, SEPA established the Diffuse Pollution Management Advisory Group. The aim of this group was to agree the rural diffuse pollution plan for Scotland, a subsection of our river basin plan. Once the plan was agreed it was very difficult for any stakeholder not to agree with what was found in the catchments and the action SEPA was taking to address the issues.

All workshops and evening meeting are arranged not by SEPA but by rural stakeholder representatives like the National Farmers Union for Scotland or the Scottish rural college. SEPA works alongside these partners organizing the events and presenting at them taking the lead role on the day. These events look at the issues identified in the catchment during the walking phase of the plan.

Over 400 workshops and events have taken place in the 14 priority catchments, reaching nearly 10,000 land managers, consultants, advisors and farming contractors. Communication with these broad groups of the rural sector raises awareness and provides the incentives for land owners to comply with rules and practices preventing diffuse pollution.

Messages to land managers

Usually SEPA has a few key messages to get across to the land manager on the day, along with offering advice on regulatory requirements and best management practices that may also benefit business. Other methods of awareness raising can also be done via press releases, articles in journals, TV and radio.

Scotland produced a "Know the rules" booklet and a mind the gap sticker for farmers based on the findings from the inspections. These documents are available on the Farming & Water Scotland website (http://www.farmingandwaterscotland.org/).

Phase 3: One to one visits with land managers and advice on solutions

This phase is about visiting all land managers within the identified areas of operation for each priority catchment to look for diffuse pollution pressures, provide advice on the regulations and suggestion on how they might mitigate against the polluting pressure.

The information gathered during the visit enables the controlling authority to access the compliance of the unit against the regulation. The land manager receives a verbal feedback at the end of the visit and within a month a paper record detailing action needed to achieve compliance with regulation. The information from the visit is collected in a similar way to the walking data.

EXPERIENCES FROM SCOTLAND (PHASE 3)

One to one farm visits

Within Scotland's 14 priority catchments operational areas SEPA has completed 3,321 one to one farm visits. Land managers are advised that SEPA will be visiting their farm on a specific date to look for diffuse pollution pressures, provide advice on the regulations and suggestions on how they might mitigate against the polluting pressure. On average one day is spend on the farm, initially with the land manager completing a steading inspection then a land based inspection.

The information gathered during the visit enables SEPA to access the compliance of the unit against the Control of pollution (Silage, Slurry and Agricultural Fuel Oil)(Scotland) Regulations 2003 as amended and the Scottish General Binding rules for land based activities. The visit looks to gather details on stock type, numbers, whether on slurry of dung, farm storage capacities, age and condition of these as well as details on forage storage and containment.

The land based visit addresses risks to the water environment from land activities. The staff walks the field/river boundaries (all watercourses on the farms, big and small) and record details of non compliance, poor practice and good practice.

Revisits to non compliant farms

In terms of revisits to non compliant farms SEPA has been back to 501 units. Over 50 % of these non compliance farms were compliant at first revisit. A further 38 % were working towards compliance, with 12 % of land managers doing nothing to address their non compliance issues. These non compliant farmers will get further revisits with the distinct possibility of legal action being taken. Currently the farmers are receiving 3 revisits before heavy handed enforcement action is initiated.

Guidance on alternative livestock watering options

As a consequence of the number of GBR non compliances observed during catchment walks and farm visits it was evident that livestock access to the water environment to drink was a major issue needing resolved to successfully reduce diffuse pollution. This lead to a research project looking at alternative watering options for the livestock sector, which has produced a set of technical guidance documents for land managers on watering options and abstraction techniques.

4. POSSIBLE FUTURE TOPICS TO BE COVERED

As mentioned in the introduction it is intended that this guidance document will be expanded with additional examples of good practice. Some topics could be included solely on the basis of online sharing of experiences through the diffuse pollution network. Other topics could be explored through an IMPEL project containing workshops and field visits.

Additional examples of controlling the Nitrates Directive's Annex II and III measures

This could be other types of good practice for the measures already covered in this guidance document or for other measures of the Nitrates Directive. As for the examples already given, new examples should be based on the European Commission's report from 2011, "Controls on the implementation of the Nitrate Directive. Results of a questionnaire among Member States. Guidelines on Controls".

Communication and awareness raising among farmers

Experience from Scotland's priority catchment work has shown communication and awareness raising among farmers as a very important factor. Similar experiences from other European countries could be compiled with the Scottish experience in an example of how communication and awareness raising can mitigate diffuse pollution.

Watering systems, fencing and shelter for field grazing livestock

In Scotland experience has been gathered about alternative watering systems for field grazing livestock (solar PV pump, ram pump, and pasture pump) instead of drinking directly from watercourses and thereby causing littering in the water.

Fencing and providing alternative watering systems prevents animals from watercourses. Animals also shelter under trees near watercourses, so it is important to provide them also with shelter/trees at distance from watercourses.

REFERENCES AND ADDITIONAL INFORMATION

IMPEL diffuse pollution project 2014: “Sharing good practice in tackling diffuse pollution and nitrate loss from farms and farmsteads”

http://impel.eu/projects/sharing-good-practice-in-tackling-diffuse-pollution-and-nitrate-loss-from-farms-and-farmsteads/

IMPEL diffuse pollution project 2013: “Achieving better compliance in the agricultural sector through networking and partnership working of environmental and agricultural inspectorates”

http://impel.eu/projects/achieving-better-compliance-in-the-agricultural-sector-through-networking-and-partnership-working-of-environmental-and-agricultural-inspectorates/

Danish standard values for farm manure and Danish normative system, Aarhus University

http://anis.au.dk/forskning/sektioner/husdyrernaering-og-miljoe/normtal

Scottish Environment Protection Agency – Priority catchments

http://www.sepa.org.uk/environment/water/river-basin-management-planning/actions-to-deliver-rbmp/priority-catchments/

Farming & Water Scotland

http://www.farmingandwaterscotland.org/farmingwaterscot/site/index.php

The Nitrates Directive

http://ec.europa.eu/environment/water/water-nitrates/index_en.html

The Water Framework Directive (WFD)

http://ec.europa.eu/environment/water/water-framework/index_en.html

APPENDICES

1. “Controls on the implementation of the Nitrate Directive. Results of a questionnaire among Member States. Guidelines on Controls” The EU commission 2011.
2. Standard form for calculating the capacity of manure storage, used in Denmark
3. Part of the standard form in appendix 2, simplified and translated into English
4. Danish Livestock Manure Order (general binding rules)
5. Scottish Diffuse Pollution General Binding Rules