

Diffuse pollution and protection of water resources: Territorial practices in the European Union

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Content

N°22

Diffuse pollution is currently one of the major pressures on Europe's water resources. To achieve the objectives of the water framework directive, the European Union member States must address this type of pollution. It is difficult to measure and control, notably due to the multitude of sources involved.

An exchange of practices and experience on this issue, between numerous stakeholders from the various basin organisations of European and neighbouring non-European countries (National agency for water and aquatic environment and International Office for Water workshop of 21 October 2015) was organised in Thessaloniki, Greece, as part of the European group conference of the International Network of Basin Organisations (EURO-INBO).

These exchanges involved the sharing of findings, recommendations and examples of good practices.

- Diffuse pollution: one of today's major issues
- What are the strategies to effectively combat pollution on a territorial scale?
- Involvement of stakeholders and peer collaboration to leverage action
- What are the strategies for the specific protection of drinking water abstraction points?
- Immediately expand vigilance to new pollutants

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I – Diffuse pollution: one of today's major issues

Diffuse pollution, an element of the qualitative management of water resources, is a topical issue shared by all member States. In 2012, the Blueprint to safeguard Europe's waters¹ already identified this pressure as one of the most significant threats to resources. Furthermore, the European Commission underlined² the increasing and now visible effects of this type of pollution across Europe. Nearly 90% of European river basin districts are affected by diffuse pollution, including 50% of surface water bodies and 33% of groundwater bodies. It is caused by agricultural activities as well as, to a lesser extent, urban and industrial activities.

The so-called "basic" measures stipulated in the Nitrates directive and article 11(3) of the water framework directive (WFD) seem insufficient to effectively combat this type of pollution. For 2/3 of European river basin districts, additional measures are essential, "despite some progress due to the reduction in the consumption of mineral fertilisers". The "measures to combat phosphate and nitrate emissions outside nitrate-vulnerable zones in the sense of the nitrates directive"² are still insufficient.

The European Commission (Claire Mc Camphill, in charge of Implementing the Water Framework Directive & water policy at DG Environment) points out that the focus should be on diffuse pollution of agricultural origin. To effectively combat this pressure, all local stakeholders must get involved and should be

properly informed. In addition to the basic mitigation measures indicated by the water framework directive and which must be included in the programmes of measures, it is also essential that the member States implement additional targeted measures, notably via rural development programmes.

The objective to restore the good status of water will only be achieved by controlling this multi-source pollution. One of the obstacles currently identified is the lack of information for local stakeholders (including farmers), who are therefore insufficiently aware of the importance of taking action. There are knowledge gaps when assessing the effectiveness of the measures to be implemented and the required timeframe to observe their effects on the quality of resources. Communication amongst all stakeholders concerned, adapted to every decision-making and action scale, from ministries to farmers, should also be enhanced to ensure this knowledge is disseminated.

There is therefore a need for continued action, and these gaps in terms of knowledge and action must be addressed to reduce the emission of the polluting substances concerned. It is also critical to improve the identification and characterisation of the pressure on aquatic environments as well as the resulting risk of impact.

II – What are the strategies to effectively combat pollution on a territorial scale?

● Reducing inputs

Substantial efforts have already been made to reduce inputs (fertilisers, pesticides) in most European countries. In Greece, for example, the principal measures implemented relate to converting to organic farming, developing tools to facilitate the sustainable management of fertilisers and irrigation, redefining

nitrate-vulnerable zones and demarcating protection areas around drinking water abstraction points. In addition, actions are undertaken to raise population awareness: training of farmers, exchange workshops on more environmentally friendly farming techniques, school educational programmes, etc.

1- http://europa.eu/rapid/press-release_IP-12-1216_fr.htm?locale=FR

2- Communication SWD(2015) 50 final of March 2015 on the progress of the programmes of measures developed as part of the WFD implementation

Many similar actions have been carried out in a number of countries, such as the British Voluntary Initiative (see box on page 8): initially created by pesticide producers to demonstrate their concern for this issue, it is now widespread across the UK. Its purpose is to provide information on plant protection products via technical data sheets and advice on their sustainable use.

Whether these actions are based on voluntary programmes or regulatory and compulsory

● Getting to know the territories

Although examples of action plans or initiatives can be found in all countries, there is no ideal and universal solution. The key to success seems to be the adaptation of technical solutions to local physical (linked to the natural environment) as well as societal and economic contexts. For example, depending on the type of geological context (karstic, fractured, etc.), the water bodies considered (depending on their size, whether surface water or groundwater) and the type of pressure on soil, the proposed actions may differ, hence the importance of performing territorial assessments (or equivalent) prior to creating any action plan.

To ensure the programmes of action are adapted to the local context, it is first of all necessary to promote and

● Farming practices at the heart of the matter

A clear distinction should be made between “better farming practices” and “changes in practices”. In some cases, combating diffuse pollution may be limited to adapting farming practices to make them more environmentally friendly. This choice most often involves lower costs, sometimes even rewards; it can be implemented more rapidly than a radical change in practices, which requires working on the acceptability of change.

Changes in practices or production systems are however often necessary. They require more upstream action, with the implementation of regulatory schemes and the potential development of new economic tools, as well as the scheduling of technical training sessions, public outreach and mobilisation, etc.

measures, they are generally supported by financial compensation systems.

Other levers of action are used and usable throughout Europe to protect certain sensitive areas: for example the planting of wooded areas in Denmark (see box on page 8) or the purchase of land and conversion to organic farming in the German cities of Leipzig and Munich on certain sites within the catchment area of drinking water abstraction points.

share all envisaged mitigation solutions. To achieve this, several countries have developed websites featuring the technical descriptions of all the measures proposed in their programmes of action, such as the UK’s Swarm³ website.

Similarly, European Cooperation in Science and Technology COST 869 (see box on page 11) was instrumental in gathering Europe’s existing scientific knowledge on nitrate and phosphate pollution abatement measures. The database developed provides a centralised source of information on these measures, accessible to all.

In these cases, the socio-economic dimension becomes clearly apparent. It is crucial to examine all types of pressure on a territory, as is the case in France for example in certain water catchment areas, via territorial pressure pattern assessments, prior to the development of any action plan. Finally, further progress is needed in terms of support tools for all stakeholders, such as the training of farmers. This is why the use of tools to help farmers use fertilisers and plant protection products, such as PLANET, MANNER-NPK and ENCASH in the UK, or SigAGROAsesor (see box on page 11), should be reinforced. Tools modelling the behaviour of pollutants in water bodies and assessing the effectiveness of measures should also be developed. This is a prerequisite for helping decision-makers devise programmes of action.

3- <http://www.swarmhub.co.uk/about.php?id=2373>

III – Involvement of stakeholders and peer collaboration to leverage action

● Focus on prevention: a consensus

In spite of their diversity, the 13 European and neighbouring non-European countries who participated in the exchanges highlighted a shared principle to combat diffuse pollution: promoting and accelerating the deployment of preventive measures.

The main obstacle to this proactive approach is the difficulty in convincing the stakeholders of the legitimacy of these measures, as they require time and resource investment when their effects on water quality and the time it takes for the results to be felt have not yet been properly quantified. This is why the motivation of all stakeholders is a key element to be considered.

● Identifying the pertinent level of action

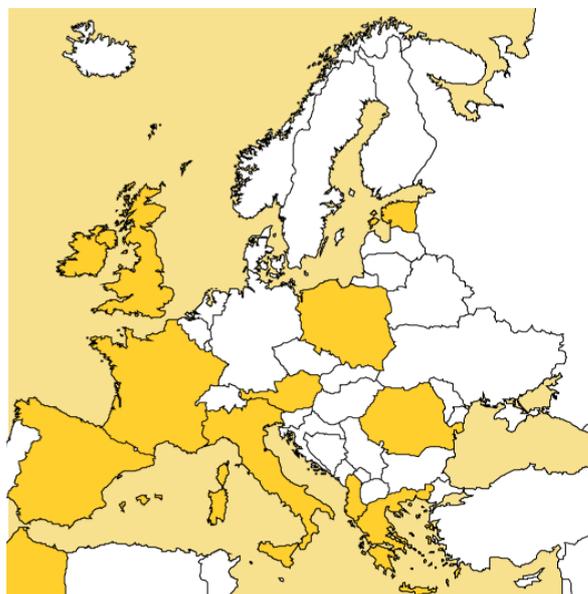
The diffuse pollution control policy must be developed and deployed on the following five levels.

1 Europe: this is the level of the common agricultural policy (CAP) which is undeniably linked to the issue of diffuse pollution; the CAP's objectives and financing concern numerous action plans, such as agri-environment programmes for example.

2 National: this is the level where tools such as guides to good practices and economic (financial incentives) or regulatory tools (use and storage conditions of fertilisers and pesticides, livestock management, etc.) can be developed.

3 River basin district: this is the level of management plans and associated programmes of measures, pursuant to the WFD. Also, in certain federated countries like Spain, Germany or Austria, actions are undertaken at regional level, such as peer counselling in the state of Upper Austria (see boxes on page 8).

4 Local: this level of action is that of the sub-basin, water catchment areas. It helps understand the link between human activities, diffuse pollution and water quality. It is also within this geographical scope that the socio-economic impact of diffuse pollution can be evaluated (drinking water, bathing, fishing, etc.). It is therefore at this level that all those concerned should work together (consumers, producers and users) to devise action plans acceptable and accepted



■ Countries that participated in exchanges of practices

by all, while finding appropriate socio-economic arrangements.

5 Individual stakeholder: for farmers in particular, this is a fundamental level of action when combating diffuse pollution. Despite the variety of approaches presented, their common elements help identify strengths in stakeholder mobilisation, such as working together, and weaknesses such as time consumption.

The action in the field directly initiated among landowners and farmers in Scotland (see box on page 10) shows that it is of the utmost importance to act directly on the individual, not only to inform them but also to impart knowledge on the diffuse pollution of water bodies and the role of agricultural activities in this pollution, as well as on the very positive impact potential changes in practices could have.

Tools are needed to guide these stakeholders through change: technical data sheets on recommended measures, individual advice on agricultural practices, tools for the sound and optimal management of inputs, etc.

● Training to inform and unite stakeholders



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Round table on risk characterisation tools (2015 EURO-INBO workshop)

This stage should not be neglected as, to guarantee the farmers' ownership of the programmes of action, whatever they may be, one must first ensure that they are well informed on the issue.

It is also essential to understand everyone's position: farmers are faced with numerous constraints and are not always aware of the impact of their activities, while water producers, who in some countries play a pivotal role in protecting water resources, also have to deal with this increasing pollution which directly affects their work. Policy-makers (e.g. local authorities), albeit enthusiastic, sometimes claim they are poorly informed in terms of the procedures for developing and implementing programmes of action.

In Scotland, the information campaign directed at farmers was based on a pragmatic question repeatedly asked by farmers: "What are the rules to be respected?". This led to the creation of guides on the rules to be observed. Practical tools were also distributed, including a small plasticised ruler which can be used on board agricultural machinery, to serve as a reminder on the distances to be respected when treating crops around a water course.

The Kooperation project in Germany (see box on page 9) also illustrates the need to train the stakeholders. The objective of this project was to train farmers in managing diffuse pollution of agricultural origin and in the measures to be implemented to combat this form of pollution.

Finally, the initiative launched in the state of Upper Austria is of particular interest: recruiting expert farmers to ensure peer training helped overcome the language barriers and conflicts of interest.

Mind the Gap Minimum legal working distances from watercourses				
<p>Within 2m of watercourse</p> <p>2m</p> <ul style="list-style-type: none"> No application of inorganic fertiliser No cultivation (2m from top of bank) 	<p>Within 5m of a watercourse</p> <p>5m</p> <ul style="list-style-type: none"> Prevent significant poaching 	<p>Within 5m of spring, well or borehole*</p> <p>5m</p> <ul style="list-style-type: none"> No fertiliser application No cultivation No livestock 	<p>Within 10m of a watercourse</p> <p>10m</p> <ul style="list-style-type: none"> No slurry or manure application No storage of fertilisers (including temporary field middens) No livestock feeders 	<p>Within 50m of a spring, well or borehole*</p> <p>50m</p> <ul style="list-style-type: none"> No storage of fertilisers (including temporary field middens) No slurry or manure application
* refers to any spring which supplies water for human consumption or any well or borehole that is not capped to prevent water ingress				
In the event of a pollution incident, contact the SEPA Pollution Helpline on 0800 80 70 60		For more information on diffuse pollution and how you can reduce risks and benefit the farm business, see www.farmingandwaterscotland.org		

Small ruler indicating the legal working distances around a water course in Scotland

● Motivation and involvement based on a shared objective

Several socio-economic studies carried out on diffuse pollution control, such as the Demonstration Test Catchments study in the UK (see box on page 11), highlighted the fact that motivating farmers inevitably requires financially supporting the changes in practices required of them. It is therefore often essential to develop economic tools, and funding must be sustainable over time, as it is now well understood that aquatic systems can take a long time to respond to the implementation of these measures (sometimes several decades).

Another motivation driver for farmers is their desire to change the all too prevalent misconception of the "farmer-polluter". They are very keen on being perceived as farmers who respect the environment and produce healthy food, safe for human health.

Another key point in encouraging stakeholder engagement is the collective definition of quantitative objectives, such as the reduction in pollutant concentrations in water for example. This helps motivate and convince them. Even if this is complicated, if not impossible, based on current scientific knowledge of the pollutant behaviour and transfer time to the aquatic compartments, the objectives of action plans should be performance targets in terms of maintaining or restoring water quality, not just resource-driven targets (number of measures implemented, percentage of farmers involved in the action plans, etc.).

IV – What are the strategies for the specific protection of drinking water abstraction points?

● From curative to preventive measures

As recommended in article 7 of the WFD, the actions undertaken to combat this type of pollution are based on a combination of measures:

- curative: increase in water treatments for drinking water production, construction of new water treatment plants, etc.;
- mitigating: water dilution by interconnecting abstraction points, decommissioning of structures;
- and preventive: at farm level, the agricultural parcel.

Only preventive measures however will be effective in the long term to reverse the trends in terms of nitrate, phosphate and pesticide pollution, which is why they must be prioritised.

They will also offer an alternative to increasing raw water treatment costs with a view to drinking water production.

● Development of action plans on the scale of the catchment area

In the specific case of drinking water abstraction points, the preferred geographical scale to effectively combat diffuse pollution is that of the water catchment basins. In France, the abstraction points at risk, given priority status by the national identification initiative and referred to as “Grenelle abstraction points” (see box on page 10), must be covered by a programme of action combining curative and preventive measures. In the UK, a change of paradigm was recently observed and drinking water production plants have developed Water Catchment Plans since the early 2000s, with a view to having a more integrated approach to the protection of water resources on the scale of watersheds.

Other action plans and initiatives consist of basic measures recommended by European directives,

additional measures (e.g. wetland restoration) which vary according to the context (water body characteristics, type of pollution, major polluting activities, hydrogeology, socio-economic pressure), and measures dedicated to raising the awareness of all stakeholders. Generally speaking, measures and actions are subsequently prioritised and targets are defined, within the limitations specified above.

It is also necessary to explore the notion of “proxi-concept”: this principle consists of proposing a list of alternative measures which can be adapted locally to each context, rather than an imposed list of measures identical for all. This helps prioritise the actions to be undertaken by adapting to the context, while encouraging everyone to take ownership of the measures and to be a driver of change.

● Principal obstacles when implementing action plans

The lack of mobilisation and coordination of the different stakeholders, often characterised by different “languages”, priorities and concerns, is the principal obstacle when implementing actions. Although they share the common objective of protecting water resources, they sometimes struggle to communicate and agree on the resources to be deployed to achieve the objective. Comparing the actual costs of changes in practices with the cost of doing nothing, combined with enhanced knowledge of the time needed to observe the positive effects of the measures deployed

in terms of water quality, would be instrumental in mobilising farmers and all those involved.



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Another major obstacle is the lack of scientific knowledge of how pollutants behave in the environment, along with a lack of pollutant transfer modelling tools. While awareness of nitrates is increasing, the behaviour of pesticides is very difficult to comprehend, notably due to the number of molecules involved and their potential degradation into by-products depending on numerous environment-related parameters.

Moreover, although models have been developed to study the behaviour of the different aqueous compartments and therefore the transfer of pollutants in these compartments, they are not always applicable to all hydrogeological contexts.

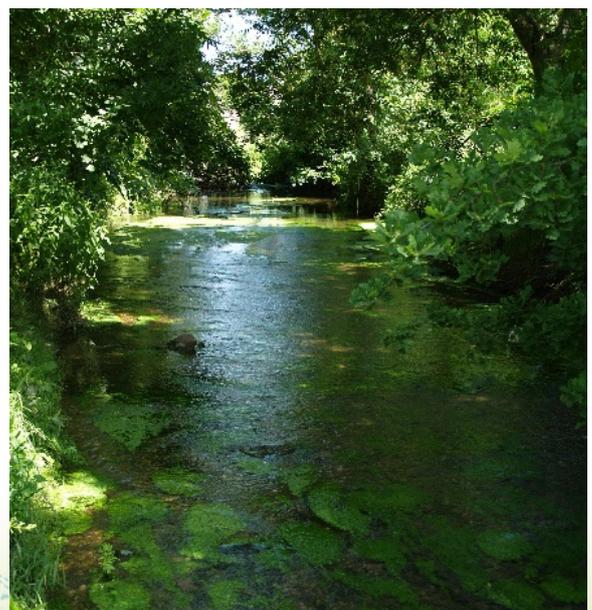
● What are the economic tools to support these actions?

A number of financial tools are used to support changes in practices and offset the farmers' loss of income when their production yields are directly affected by these changes (e.g. conversion of certain parcels into grasslands). The money used for the various funding mechanisms in place comes from the CAP, rural development funds, national funds or fees paid by users and sometimes the introduction of taxes. Payment of aid or subsidies is generally subject to strict specifications which farmers must respect.

A particularly interesting concept of positive incentive is applied in Austria, which consists in allowing a farmer to obtain more credits if they go beyond the minimum requirements, resulting in an increase in subsidies.

U – Immediately expand vigilance to new pollutants

When we talk about diffuse pollution, nitrate, phosphate and pesticide pollution is the major focus of concern as well as control and mitigation actions. Yet it is important to immediately expand the monitoring of water bodies to other emerging pollutants. Although these new pollutants are not as widespread, it would be advisable to anticipate their measurement and control. This is all the more valid as we now know how slow the pollutant transfer kinetics in the different water bodies are (surface water or groundwater), even though this depends to a great extent on the vulnerability of the environments considered, the level of pressure, etc. It will therefore take a long time to observe the beneficial effects of the mitigation measures put in place.



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Long-established strategies



The Voluntary Initiative in the UK

In 2001, the British government decided to develop The Voluntary Initiative, initially put forward by the agricultural industry to minimise the impact of pesticides on the environment, as an alternative to the introduction of a tax. This voluntary initiative is currently being deployed throughout the UK. Information sheets on each pesticide and instructions on how to use them (notably their potential impact on the environment) are available on their website and regularly updated. In addition, numerous management schemes have been developed nationally as part of this initiative, such as the "H2OK?" project, the purpose of which is to provide advice on good practices to be implemented to prevent pesticides from damaging the aquatic compartments.

To find out more:

<http://www.voluntaryinitiative.org.uk/en/home>



Planting of wooded agricultural land in Denmark

After losing more than 14 million m³ of water in 20 years due to the shutdown of overly polluted drinking water abstraction points, Denmark encouraged the Copenhagen Energy organisation, which supplies the city of Copenhagen and its surroundings (one million residents) to conclude contracts with private forest owners (payment in return for the non-use of pesticides) and reforest agricultural land.

This system is based on payment for ecosystem services.

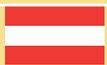
Pour en savoir plus :

Final report study on the Economic value of groundwater and biodiversity in European forest (January 2009)

http://ec.europa.eu/environment/forests/pdf/grounwater_report.pdf

One recurring question: how to motivate stakeholders?

By informing and involving them



Peer counselling in Austria

In 2001 the state of Upper Austria set up a guidance, assistance, training and experimentation programme to advise farmers with a view to protecting groundwater. This programme is not designed for control purposes and is implemented by a team of six "water experts" who recruit 41 "water farmers" under contract, acting as advisors, coordinators and experts in charge of small groups of farmers (around 40) spread over 60 small, sensitive regions. This is a unique approach in two respects: these advisors are farmers, selected for their expertise, who have been specifically trained; they receive continuous training and are remunerated; they are acknowledged by their peers whom they coordinate in small local groups, and share the same language (economic efficiency).

To find out more:

<http://www.bwsb.at/>

By advising and training them



The Kooperation project in Germany

This project is based on a cooperative and interdisciplinary approach model to protect drinking water, essentially from agricultural pollution. It is largely financed by a water tax introduced in 1992, by the rural development plan of the state and the European Agricultural Fund for Rural Development (EAFRD). The funds are used to provide farmers with technical training and advice from chambers of agriculture or private organisations, and for the payment of financial compensation to the farmers who implement localised agri-environmental measures. These agreements complement the EU-based territorial agri-environmental measures. To support this programme, the government of Lower Saxony is financing applied research projects to define solid standards with a view to improving the development and application of measures, justifying the amounts compensating for opportunity costs, establishing priorities and for control purposes (annual budget: €300,000/year).

To find out more:

http://www.umwelt.niedersachsen.de/portal/live.php?navigation_id=2572&article_id=8944&psmand=10

By bringing them together with a shared objective



Groundwater protection strategy, Weser-Ems district, Lower Saxony state

Lower Saxony is Germany's second largest state (47,000 km²). The Weser-Ems district, situated to the West of the state, is primarily characterised by livestock production farming (80%, the rest being occupied by forest), with a significant production of manure. All the drinking water is produced from groundwater. 72 abstraction points have delineated protection areas, within which activity restrictions have been imposed for decades.

This system has failed to reduce nitrate concentrations in raw water. Other measures have been taken, such as compensatory payments for loss of business or free agricultural advice.

One of the major obstacles to taking action was the limited involvement of all stakeholders (water producers and farmers). Two factors helped resolve this situation:

- the development of voluntary agreements and the creation of cooperative working groups to bring together all stakeholders;
- a reflection on how to assess the effectiveness of the measures implemented, to establish quantitative objectives, with a view to bringing the stakeholders together based on a common and shared goal; this is how four objectives were jointly defined: the farmers' acceptance of the measures (estimated based on the number of voluntary agreements concluded), the measurement of nitrate concentrations in abstraction wells, the measurement of mineral nitrogen amounts in soil after autumn harvest and the calculation of nitrogen balances.

To find out more:

<http://awsassets.panda.org/downloads/proceedingsseminar1.pdf> (page 121)



The Scottish approach, in priority catchment areas

In Scotland, after identifying several priority catchment areas in which the risk of failing to achieve the WFD's objectives and the risks to human health were very high, the following process was deployed:

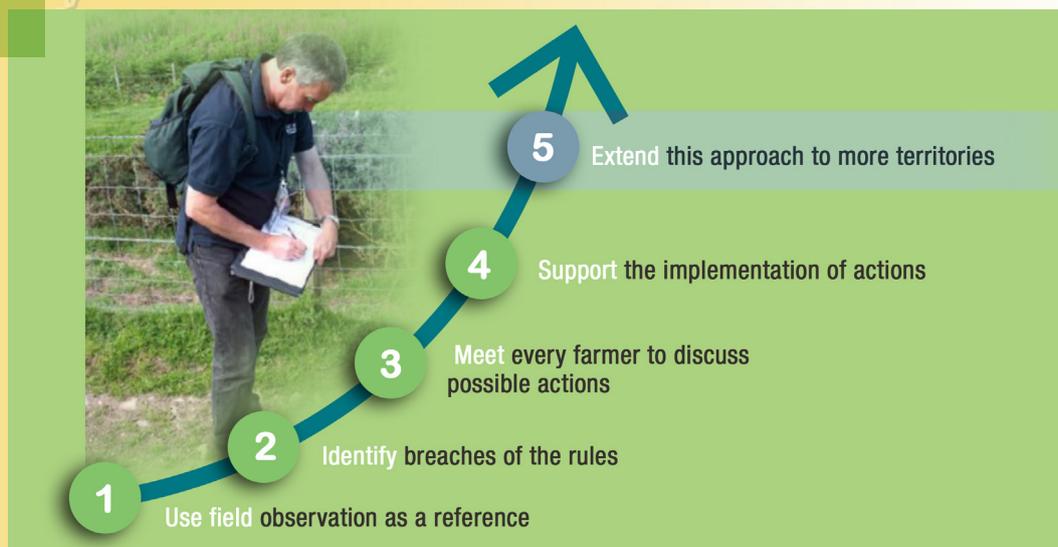
- **field diagnosis in the form of observation walks** along the water courses of priority catchment areas to compile a walking inventory of non-compliances (inadequate storage of livestock manure, livestock watering from rivers, etc.) as well as good practices to be disseminated and promoted. All information derived from this stocktaking exercise is subsequently stored in a database to identify priority intervention areas and actions adapted to the situation;

- **organisation of collective workshops** in rural areas to discuss the various options and reach a compromise between all those involved;

- **visits to farmers** to envisage solutions on how to reduce diffuse pollution in their parcels. Subsequent follow-up visits showed that, in 80% of the cases, compliance work was completed or at least initiated. This process should be extended to other catchment areas, according to the human and financial resources available.

To find out more:

http://www.sruc.ac.uk/info/120603/farming_and_water_scotland



Source: *Scotland's Approach to Diffuse Pollution - Darrell Crothers (SPEA, Scotland)*



Grenelle laws on the environment and identification of priority abstraction points: "Grenelle abstraction points"

In France, out of the 34,000 abstraction points used to produce drinking water, in 2015 approximately 3,000 were affected by nitrate and pesticide pollution, not to mention another 1,958 which were out of use from 1998 to 2008. To remedy this pollution, 532 abstraction points were referred to as priority as part of the 2009 Grenelle law, the objective being to develop action plans specific to these "Grenelle abstraction points" and restore their water quality. The 2013 environment conference reasserted the need to continue the diffuse agricultural pollution control action in water catchment areas, resulting in 500 new abstraction points being added to the list of existing Grenelle abstraction points.

To find out more: <http://www.onema.fr/IMG/pdf/captages-double-16-10-13.pdf> et <http://www.onema.fr/IMG/pdf/captages-cpa.pdf>



The Life+ sigAGROasesor project

This European project, initiated in September 2012, was completed in December 2015. Its objective is to produce a GIS tool to help farmers manage their crops as effectively and sustainably as possible, with a view to promoting extensive production. An initial version of the platform was opened to farmers involved in the project in October 2014.

To find out more:

<http://agroasesor.es/en/el-proyecto.html>



DTC socio-economic survey on the effectiveness of mitigation measures

In the UK, as the implementation of measures likely to reduce diffuse pollution is essentially voluntary, farmer participation is increasingly perceived as a key success factor. This is why the British government financed the Demonstration Test Catchments project (DTC), in an effort to enhance the farmers' knowledge of the positive impact of changes in practices on water quality. One of the key aspects of the DTC programme is the collaborative and open research conducted, involving the concept of research platform which helps associate the theoreticians who design the models with the people in the field. Farmers as well as sociologists and economists work alongside modellers to guarantee the operational effectiveness of the proposed approaches.

To find out more:

<http://www.demonstratingcatchmentmanagement.net/>

Demonstration
Test
Catchments



COST 869 European scientific cooperation: measures to reduce nutrients in water

The COST 869 initiative, which was completed at the end of 2011 after five years of activity, involved measures to mitigate nitrogen and phosphorus concentrations in surface water and groundwater. This initiative produced a series of very detailed data sheets on the measures for reducing the nitrogen and phosphorus inputs of agricultural activities and, more importantly, a database giving access to all possible measures according to the type of climate, soil, production system, major issues and constraints encountered, action levers identified and therefore the type of solution envisaged (crop and land use management, etc.) or associated costs.

To find out more:

<http://www.cost869.alterra.nl/>

● Find out more

<http://www.riob.org/events/21-24-octobre-2015-thessalonique/communications-papers-765/21-octobre-2015/papers-of-the-workshop-on-diffuse/?lang=fr>

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<http://www.onema.fr/sites/default/files/EN/EV/cat7a-thematic-issues.html#action>