UNDP-GEF Danube Regional Project

Final Report

for

"Development of Indicators for Project Monitoring and Impact Evaluation"

April 16, 2004

Dr. J. Dogterom *
Drs. J.P.E. van Leeuwen **
N. Koopmans **
G. Robijn **

Oudebildtdijk 1058
9075 NK Westhoek
The Netherlands
Tel.: +31-518-491838
Fax: +31-518-491944
Email: j.dogterom@tech.nhl.nl

Leeuwarden University for
Professional Education
Tesselschadestraat 12
8913 HB Leeuwarden
The Netherlands
Tel: +31-58-2961164
Fax: +31-58- 2961188
Email: j.p.e.van.leeuwen@ecma.nhl.nl

PREFACE

The long term goal of the DRP is to strengthen capacities of key Danube stakeholders and institutions to effectively and sustainably manage the Danube River Basin's water resources and ecosystems for citizens of Danube countries.

River basin managers need to be able to monitor changes, hopefully improvements, but also deterioration in the river basin ecosystem. Moreover, there is the need to be able understand the effects of measures (policies, investments etc.) in order to make more informed decisions in the future. It is clear that the development and use of indicators should be an iterative process. The more indicators are used, the more precisely they can be developed and utilized.

The objective of this assignment was to develop a system of indicators for two purposes:

i. to monitor the impact of activities carried out by the UNDP/GEF DRP and

ii. to establish a system to be able to assess and monitor the changes in the DRB system due to various interventions. I.e. to establish a system of indicators that will function long after the end of the DRP as a management tool to both understand the effects of specific interventions, as well as to provide a basis upon which to decide upon new interventions.

The assignment was intended to propose a system of indicators that is functionable, multi-purpose and practical. This is a challenging task as it needs to be relevant for the EU WFD, the GEF guidelines for monitoring and impact evaluation as well as reliable for monitoring the implementation of the DRPC.

The efforts in this Phase 1 assignment resulted in a clear strategy for introducing a system of indicators for the DRB. Nevertheless it is a challenging task to develop a system of indicators that should meet the relatively short-term needs of demonstrating the results of the DRP, while also (and perhaps more importantly) showing the conditions of the DRB over a longer (perhaps more relevant) time period. As the old proverb goes, "a journey of a thousand miles, begins with a single step." Thus, this assignment and the system it proposes should be seen as the starting point.

The results of this component are intended to be a basis for the ICPDR, with the continued assistance of the DRP, to implement the proposed system of indicators during Phase 2 of the DRP from 2004-2007.

The report was prepared under the guidance of Jan Dogterom and associated experts. and reflects the views of this expert team. The report and its contents remain the property of the UNDP/GEF DRP and should not be used without providing full credit to the DRP.

For further information about the DRP, objectives, activities, results etc. please visit the DRP webpage at www.undp-drp.org .

CONTENTS

LIST OF ABBREVIATIONS

BAP	Best Agricultural Practice
BAT	Best Available Technology
BSC	Black Sea Commission
BSERP	Black Sea Ecosystem Recovery Project
DABLAS	Danube-Black Sea Task Force
DPSIR	Driving Force-Pressure-State-Impact-Response
DRP	Danube Regional Project
EEA	European Environmental Agency
EU	European Union
GEF	Global Environment Facility
ICPDR	International Commission for the Protection of the Danube River
IWTF	International Waters Task Force
JAP	Joint Action Plan
LFM	Logical Framework Matrix
M & E	Monitoring and Evaluation
MoU	Memorandum of Understanding
OECD	Organization for Economic Cooperation and Development
PCU	Programme Coordination Unit
PSR	Pressure-State-Response
RBM	Result Based Management
RIVM	Rijksinstituut voor Volksgezondheid en Milieubeheer (National Institute of Public Health and Environmental Protection)
SAP	Strategic Action Plan
SOP	Standard Operational Procedure
UNDP	United Nations Development Programme
UNEP	Untied Nations Environment Programme
WFD	Water Framework Directive
WB	World Bank

EXECUTIVE SUMMARY

The United Nations Development Programme/Global Environment Facility (UNDP/GEF) is the main international donor to support implementation of the Convention for the Protection and Sustainable Use of the Danube River Basin. Support is provided in the frame of the regional Danube Project (DRP). The Council of the GEF wants to be informed on an annual basis by all projects, financed by GEF, on the performance of the projects. The Council considers Monitoring and Evaluation (M & E) of project outputs and outcomes an indispensable tool for project management. It should serve both as a corrective function during project implementation and as a guide to structure future projects more effectively. Actually, all GEF projects must include M & E provisions. In this context, the GEF-DRP has developed a system of indicators as the basis for reporting to the GEF Council. This indicator system allows to monitor and evaluate project performance and complies with the reporting requirements of the GEF Council. The GEF M & E unit has defined the types of indicators to be applied: process indicators, stress response indicators and state indicators. The GEF reporting requirements and these definitions were used for the development of the indicator system.

At the same time an indicator system is under development now within DG-Environment (DG-ENV) and the European Environmental Agency (EEA) of the European Commission to comply with the reporting requirements of the new EU Water Framework Directive (WFD). According the latest information, DG-ENV will use the Driving Force-Pressure-Status-Impact-Response cycle as the concept for indicator development.

This report describes the concept of 2 indicator system for GEF and DG-ENV/WFD and presents a number of examples of individual indicators and methodologies for quantification and assessments, including aggregation techniques for clusters of indicators.

For the GEF M & E, 3 categories process indicators were defined on basis of the 4 Objectives, as described in the Logical Framework Matrix in the project document of the DRP. Individual process indicators proposed, are directly related to the outputs and outcomes of the DRP also formulated in the Logical Framework Matrix. Methodologies for quantification and aggregation are recommended. There are 4 categories of stress reduction indicators proposed and 22 individual indicators. Similarly there are 4 categories of state indicators proposed and 18 individual indicators. These are considered long lists. Selection of a core list of individual indicators was done on basis of 3 selection criteria which resulted in a core list of 20 individual stress reduction and state indicators. A number of examples are presented together with quantification and presentation techniques.

In the DPSIR concept of DG-ENV/EEA, the state and response indicators are identical to the state and stress reduction indicators in the GEF methodology. There are 6 categories of driving force indicators proposed and 19 individual indicators of which 11 at the core list. These indicators are based on information which is collected by national governments and /or Eurostat and should not require any activities with regard to raw data collection by the ICPDR. There are 4 categories of pressure indicators proposed and 12 individual indicators of which 10 at the core list. There are 4 categories of impact indicators proposed and 7 individual indicators of which 4 at the core list.

These indicators are based on information which is collected by the ICPDR through the TNMN and EMIS.

For both systems, 1996 is recommended to be used as the baseline, since the database of the ICPDR is considered reliable and complete since that year.

1. INTRODUCTION AND BACKGROUND INFORMATION

The Convention for the Protection and Sustainable Use of the Danube River Basin came into force in October 1998 and has been signed and ratified now by 12 of the 13 eligible countries and the European Commission. The Convention is the institutional frame for pollution control and the protection of water bodies and it sets a platform for sustainable use of ecological resources and coherent and integrated river basin management. The Danube countries have established the International Commission for the Protection of the Danube River Basin (ICPDR) to support implementation of the Danube River Protection Convention. International support is provided by a number of donors to facilitate the implementation of the Convention. At present, the United Nations Development Programme/Global Environment Facility (UNDP/GEF) is the major contributor providing support in the frame of the Danube Regional Project (DRP). Institutional arrangements have been set up and joint measures for pollution reduction and river basin management have been designed and are in the process of being implemented in order to achieve the objectives of the Convention. The process of transboundary cooperation has been further stimulated by the requirements of the new Water Framework Directive (WFD) of the European Union (EU), which came into force on 22 December 2000.

The Parties to the Convention are EU member, Candidate-Member, or have adopted the EU water policy into their national water policy. The WFD formulates reporting requirements of Member States to the EU to facilitate the evaluation by the Commission of the progress towards the achievement of the WFD objectives. At present methodologies for reporting are being designed and tested. New analytical frameworks are discussed (see ref. 1, 2 and 3). Also the Danubian countries have to adopt a streamlined reporting system to monitor and evaluate the efficiency of their policies, institutional settings, investment decisions etc. In this context, a system of indicators to monitor and evaluate policy efficiency is needed. The system should comply with the WFD reporting requirements.

The GEF is the main international donor to support implementation of the Convention. The Council of the GEF wants to be informed on an annual basis by all projects, financed by GEF, on the performance of the projects. The Council considers Monitoring and Evaluation (M & E) of project results an indispensable tool for project management. It should serve both as a corrective function during project implementation and as a guide to structure future projects more effectively. Actually, all GEF projects must include M & E provisions. In this context, the GEF/UNDP-DRP has to develop a system of indicators, as the basis for reporting to the GEF Council. This indicator system should allow to monitor and evaluate project performance, and has to comply with the reporting requirements of the GEF Council.

The GEF/UNDP-DRP has commissioned a consultant to develop proposals for indicator systems for M & E of the DRP and to assess policy efficiency by the parties to the Danube Convention. This report presents the results of this activity.

2. OBJECTIVE OF THIS ACTIVITY

The objective of this activity is:

"Establishing a system for M&E in using specific indicators for process (legal and institutional frame), stress reduction (emissions, removal of hot spots) and environmental status (water quality, recovery of ecosystems) to demonstrate results of program and project implementation and to evaluate environmental effects of implementation of policies and regulations (nutrient reduction)."

This activity addresses the establishment of two types of indicator systems, which have two different purposes:

> Indicators to monitor and evaluate Project results

> Indicators to evaluate effects of specific policies and regulations

3. PROBLEM DEFINITION

3.1. Why a system of indicators

The improvement of environmental quality in general, incl. in river basins, requires many measures, ranging from the establishment of institutional structures to increasing public awareness, or to investments. The process consists of very many, usually small, steps over a considerable period of time. Information collection on the process itself and its results, and proper interpretation and use of this information is crucial for efficient use of scarce resources. A transparent system of information collection and interpretation is therefore a major activity in river basin management.

The new EU-WFD stipulates this again by putting new and high requirements on the EU Member States with regard to reporting (art. 15 of WFD). The ICPDR has agreed on a procedure for joint reporting to the EU, based on national reports of the Parties to the Convention. Issue specific Working Groups are working on reporting. The products of these working groups have been taken into account for the development of the proposals for indicators. The proposed system needs also to support reporting on the efficiency of the Joint Action Programme (JAP) and reporting to the national governments and the public at large in the Danube Basin.

The efforts of the Danubian countries to protect the Danube river are supported by a series donors of which GEF/UNDP is the most important one at the moment. In March 2001, Phase 1 of the GEF-Danube Regional Project started. It is expected, that the Project will continue with Phase 2 per 1 November 2003. According to Objective 4, the Project will support the development of indicators for project monitoring and evaluation. The development and application of such a system is required by the donors to the GEF, represented by the GEF Council. The GEF follows its own methodology with regard to the selection of an indicator system, and the proposed system in this activity should comply with the requirements of the GEF International Waters Task Force (IWTF, see ref. 4).

In addition, the ICPDR has to report on the implementation of the MoU between the ICPDR and Black Sea Commission (BSC) on nutrient reduction, which is being supported by the Danube-Black Sea Joint Technical Working Group.

4. CONCEPTS

4.1. General

Application of environmental indicators became a serious reporting tool in the early nineties with the Organization for Economic Cooperation and development (OECD) started applying indicators in the national environmental performance reviews (see ref. 5) and with the United Nations Environment Programme (UNEP) developing global environmental outlooks (see ref. 6). The concept of indicators initially included the cycle: pressure- state-response with OECD distinguishing pressure as indirect pressures (economic activities, demographic developments) and direct pressures (emissions etc). Indicators according this cycle were proposed for environmental issues like climate change, ozone depletion, eutrofication, water resources, biological diversity etc. The cycle was extended in 1994 with impact indicators, proposed by RIVM (see ref. 7). The European Environment Agency (EEA) replaced the OECD definition for pressures in 1999 by 2 distinct indicator types: driving forces and pressures (see ref. 8). Since then the concept of the cycle: driving force-pressure-state-impact-response (DPSIR) is widely accepted, eg also by the United Nations Economic Commission for Europe (UNECE, see ref. 9) and is now being made operational by EEA (see ref. 10).

The EEA is applying this set of indicators for assessment of water resources on the basis of issues: ecological quality, eutrofication, pollution with hazardous substances and water quantity (see ref. 2). The use of the DPSIR cycle however shows that the same individual indicator can be relevant in each issue. This is shown by the latest report of EEA on water (see ref. 2). It is thus questionable whether the issue approach is the most efficient in terms of transparency. In this report an other choice has been made: the DPSIR cycle has been applied in an integrated way, not separating the individual indicators on basis of issues. This approach is considered more appropriate to support decision making in integrated water resources management. Neither of the concepts mentioned so far addresses the issue of the baseline. The concept of using a baseline is proposed by the GEF Waters Program Indicators Steering Group (see ref. 11) and further stressed by the WB GEF Secretariat (see ref. 4). This concept has been included in the proposals for indicators in this report. The GEF M & E indicator concept is different from the ones developed by OECD, UNEP and EEA, since it serves a different purpose. In the following paragraphs a more detailed description of each concept is presented.

In March 2004, internal reports of EEA showed major potential developments at EEA with regard to indicator selection and application. An initial list of over 400 indicators may be reduced to a core list of only 37 indicators of which 3 for biodiversity, 5 for fresh water, 4 for coastal and marine waters, 2 for agriculture and 3 for fisheries. In these internal documents no reference is made to the DPSIR cycle, not even to the WFD. Since it is not clear how this is coordinated with EU DG-ENV at the moment and no final decisions are available at this moment, this report will still use the DPSIR cycle as the main concept.

4.2. Indicators for GEF M & E reporting requirements

The development of an indicator framework for M & E of GEF International Waters Projects started in 1996 by the former GEF-IWTF. In the 1996 Guidelines for WB-GEF International Water Projects the distinction was made between performance and process indicators. Performance indicators relate to the environmental and socio-economic impact of a project. *Environmental performance indicators* measure the project's specific contribution to the solution of specific environmental problems. These indicators use the PSR-framework: for each of the components pressure, state and responses indicators should be formulated. Socio-economic impact assessments require another set of indicators, *socio-economic indicators*.

According to the 1996 Guidelines, in addition to monitoring performance vis-a-vis project objectives, M&E procedures should also monitor progress in project activities designed to accomplish the stated project objectives. This is measured by *process indicators.* Traditionally process indicators relate to project inputs and project outputs, like procurement and delivery of goods and services. The 1996 Guidelines recognized the increasing importance of capacity-building, human resource development, and stakeholder involvement for sustainable project outcomes, and recommended that process indicators for these activities should be developed

The importance of process indicators is stressed even more in the 2002 GEF M&E Indicators (see ref. 12), and in the description of the implementation of the general policy for the International Waters Projects (see ref. 4). It is recognized that the reversal of environmental degradation in complex transboundary waters may take decades. Even meaningful commitments to joint management improvements may take 15-20 years. This means that process indicators are needed to monitor the actual step-by-step progress toward the adoption of the joint management regimes, country-based reforms, and priority investments. In addition to these process indicators two other types of indicators are recommended, i.e. *Stress reduction indicators*, and *Environmental status indicators*. Therefore for M & E of the DRP these 3 indicators are recommended using the following **definitions**:

Process indicator: process indicators are indicators, that characterize progress in political, institutional and legal changes (improvements) at regional or national level as the result of a GEF project intervention. A typical example is the establishment of an interministerial committee to reduce sectoral stress/pressures on a defined water body by developing sectoral legislation or regulation or the completion of a Strategic Action Plan (SAP) for a defined water body.

Stress reduction indicator: stress reduction indicators are indicators, that characterize progress in the implementation of specific measures to reduce stress/pressures on a defined water body as the result of GEF project intervention. A typical example is a completed investment programme to reduce pollution loads from point sources in a defined water body or the implementation of a management plan to protect or restore ecological functions of flood plains, wetlands or fishing zones in a defined water body.

State indicator: state indicators are indicators, that characterize (quantitatively) the ecological quality of a defined water body at a specific moment. A typical example is the concentration of pollutants or the biological characteristics of a specific ecosystem. A state indicator can be related to a "target value": good ecological status or a water classification system.

4.3. Indicators for WFD and EEA reporting requirements

The reporting requirements for the WFD are described in art. 15. This article refers to articles 5, 8 and 13, incl. annex VII. In these articles, the principles of information and data collection and assessment (art. 5 and 8) and for the content of the River Basin Management Plan (art. 13 and annex VII) are laid down. These principles are further elaborated in the Guidance Documents, which have been produced by the EU to support harmonized implementation of the WFD. These can be found on the EU website. The purpose of the system of reporting is to evaluate policy performance of the EU Member States. At present there is general consensus among international organizations to apply the DPSIR cycle for the assessment of success of environmental policy. The EU-WFD has accepted this approach as the basis for reporting (see ref. 1). The following **definitions** apply to these indicators:

Driving Force indicator: driving force indicators are indicators, that characterize (quantitatively) the development of anthropogenic activities with an impact on a defined water body. A typical example is economic growth (eventually per sector: agriculture, transport, etc) or demographic development.

Pressure indicator: pressure indicators are indicators, that characterize (quantitatively) the pressure on a defined water body. Pressures are the direct effect of driving forces: the results of human activities with adverse effects on the environmental quality of a defined water body. A typical example is the load of toxic pollutants from point or non-point sources or fish catch.

State indicator: state indicators are indicators, that describe the ecological quality of a defined water body at a specific moment. A typical example is the concentration of pollutants or the biological characteristics of a specific ecosystem. A state indicator can be related to a "target value": good ecological status or a water classification system.

Impact indicator: impact indicators are indicators, that characterize (quantitatively) the environmental consequences of driving forces/pressures. These consequences are the change (loss) of desired functions of a defined water body. A typical example is the deterioration of an ecosystem by reducing biodiversity or the loss of water resources for drinking water production.

Response indicator: response indicators are indicators, that characterize the outcome of political, managerial or economic human interventions to address the impact of pressures or to improve/restore the environmental status of a defined water body: "the human feed back system". A typical example is the implementation of an investment programme in waste water treatment plants or the legal enforcement of best agricultural practices (BAP).

4.4. GEF and WFD compared

Although serving different purposes, there is a relationship between process indicators, stress reduction indicators and environmental status indicators on the one hand, and the components D, P, S, I, R in the WFD framework on the other hand.

Process indicators, relating to legislation, institution building etc., are in the present situation in the Danube basin not real response indicators, in the sense of the DPSIR-cycle. Rather they are indicators of progress in the pre-response phase. Building up institutions, inter-governmental cooperation, legislation etc. are necessary pre-conditions for responding. In this sense the GEF-

project should help the Danube countries to use the WFD-system in the future, by assisting in the development of different components.

Stress reduction, on the other hand, can be seen as a response in the meaning of the WFD cycle.

For environmental status indicators according to the GEF it seems, that there is no difference with the status indicators according to the WFD.

In conclusion, there are possibilities for using indicators developed in the GEF-project also for WFD reporting requirements. Therefore It is important to keep in mind that GEF related indicators should be compatible with WFD indicators.

4.5. Indicator selection criteria and data and information requirements

Selection criteria

The OECD (see ref. 5 and 13), UNEP (see ref. 6) and very recently EEA (see ref. 10) have published criteria for selection of environmental indicators. The lists of these 3 international organizations show more or less overlap. For the selection of indicators for M & E of the DRP and for reporting by the ICPDR according WFD-EEA requirements, criteria have been derived from these lists by combining different criteria from the lists and simplify them for the specific purposes of reporting on the Danube basin.

For the selection of indicators, the following criteria have been applied:

1. Policy relevant

   Indicators must support policy development and decision making; there should be a relation with policy priorities and policy objectives and targets as described in policy documents, conventions, legislation and regulations.

2. Analytically sound and robust

   Indicators must be scientifically and technically well founded and robust. They must be representative, readily available and routinely collected. They must be consistent in space and time: it must be possible to define a baseline. Data must be collected in Standard Operational Procedures (SOP) within fixed reporting periods.

3. Communicative powerful.

   Indicators should be communicative powerful. Results have to be communicated in Annual Reports, websites, press communications and during stakeholder consultations.

4. For process indicators: structural

   In the GEF M & E indicator system, process indicators should be connectable to each other, for instance in an input-output-outcome scheme.

Data and information requirements

Although the indicator systems to be developed will serve the GEF and WFD reporting purposes, it would be highly preferable if selected indicators use the same data sets or other sources of

information The indicators to be selected will need raw data sets and information, which has been or will be collected by GEF-DRP and/or the ICDRP Secretariat. The ICPDR has set up, with help of UNDP/GEF and other donors, an extensive system of data and information collection. Data is collected in existing reporting procedures. Collecting data is costly, and the collection of new types of data or information should be avoided, unless it appears, that data or information, critical for monitoring and evaluating project results and/ or policy compliance by ICDRP members, is missing. The ICPDR data base has 2 main sub databases: the TNMN database and the EMIS database. These lists of variables are considered a long lists of variables, which are the basis for the selection of **a core list.**

4.6. The problem of the baseline

The indicator system(s) will assess different types of changes: environmental quality, capacity for waste water treatment, institutional settings, public awareness, biodiversity etc. These changes need to be assessed in relation to the process of river basin management over time. Therefore, the situation at the start of the process has to be defined: the baseline. According the GEF International Waters Program (GEF-IWP) Indicators Steering Group, the definition of the baseline is the following:

"The situation that existed at the beginning of a Project, defined in terms of intergovernmental institutional arrangements, human activities, which degrade the environment or environment status."

This definition is related to the specific use of an indicator system for the assessment of the process. It concerns indicators of the (change of the) institutional arrangements and human activities, which degrade the environment. It does not include indicators on the (change of the) environment itself. A number of questions has been considered:

1. Using this definition, is the baseline the situation in the basin at the start of the 1st GEF Environmental Program for the Danube River Basin (EPDRB) in 1992 or at the beginning of the present GEF-DRP? This limited interpretation would probably be enough for the GEF Council.
2. Is it necessary to use a broader definition for the baseline, and to include the environmental status of the basin at the beginning of the EPDRB or at the moment of signing the Danube Protection Convention, or the establishment of the ICPRD Secretariat?

In the GEF reporting requirements, the establishment of the baseline is a clear issue. In the WFD and the recent EEA report (see ref.2), there is no reference to any baseline.

Since the ICPDR has a reliable database on pressures, status and investments (responses) in the Danube basin since 1996, 1996 is proposed as the baseline for both sets of GEF and EEA-WFD indicators.

5. RESULTS

5.1. System of indicators for GEF M & E

5.1.1. Introduction

The proposed selection of categories of indicators and individual indicators for GEF M & E is presented in this paragraph. The process indicators should have a direct relationship with the objectives, outputs and outcomes, as presented in the Project Document of the DRP, in particular with the Logical Framework Matrix (LFM). The stress reduction indicators consist of indicators related to implementation of policies; this implies development, implementation and enforcement of policy measures, such as new legislation and regulations, but also investments as a result of policy implementation. According the GEF M & E definition, loads of pollutants are an environmental stress. In the DPSIR cycle, loads of pollutants are pressures and policy enforcement and investments are responses. In the GEF M & E system this distinction cannot be made. Therefore, loads are presented here under stress reduction indicators. State indicators are clearly defined. The categories proposed are based on the present structure of the TNMN database.

5.1.2. Categories of indicators

5.1.2.1. Process indicators

The basis for selection of process indicators is found in the DRP Project Document, in particular the LFM. Ideally the system of process indicators should be part of the LFM of a project. For each objective outputs, outcomes and the related quantifiable indicators should be formulated and methods to measure progress and quality should be defined in advance.

In the LFM of the DRP, this is only partly done. In order to be able to apply a consistent set of indicators, the structure of the project document and the LFM have to be consistent as a start. The grouping of objectives and the formulation of outputs and outcomes in the Phase I and Phase II documents and LFMs is not considered consistent. For example: the output 4.4 of Objective 4 would logically fit better under Objective 2: capacity building etc. and output 2.2 has a strong relationship with all outputs in Objective 4. Therefore the following rearrangement of outputs under 3 main Objectives are proposed: see annex I.

1. Consolidation and operation of institutional mechanisms for cooperation under the ICPDR

2. Development of policy guidelines and legal and institutional instruments

3. Strengthening of public participation

5.1.2.2. Stress reduction indicators:

These indicators should measure the result of interventions by the Danube countries, that result in improvement of the environmental conditions. These interventions are formulated in policy and legal documents as the Danube River Protection Convention, the JAP, the Danube-Black Sea Task Force (DABLAS) work programmes and other international and national legal documents and regulations.

Such interventions should be followed by investments, which result in a reduction of pollutant loads and/or recovery of the ecosystem. Any policy cannot succeed without stakeholder involvement and sufficient public support. Therefore implementation of programmes for stakeholder involvement and public awareness raising are considered to contribute to stress reduction. The following categories are proposed:

1. Implementation and enforcement of regional and national legislation and regulations
2. Investments
3. Reduction of pollutant loads
4. Implementation of stakeholder involvement and public awareness raising programmes

5.1.2.3. State indicators:

The stress reduction interventions should result in improvement of the environmental conditions in the Danube basin. The state indicators should reflect these conditions. The ICPDR is collecting a vast amount of data on the Danube status. The categories proposed should be based on the information collected at one hand; on the other hand the quality of the ecosystem has to be covered as well. The following categories are therefore proposed:

1. Hydrology
2. Water quality
3. Ecological quality
4. Suspended solids/sediment quality

5.1.3. Individual indicators

5.1.3.1. Process indicators

The GEF has accepted a Result Based Management approach (RBM). This means that the emphasis should lie on output and outcome indicators, as the overall performance of the process is measured in these terms. Economy and efficiency are of course necessary, but are in RBM considered mainly as an internal responsibility of the management of the process, with only limited reporting requirements. The delivery of outputs as planned (timeliness, quantity etc.) is also the responsibility of the management of the process, and it should explicitly be held accountable for this. Whether the outputs will have the desired outcomes, is the joint responsibility of the management and the other stakeholders. They should assess if the outputs in principle have the desired quality. Even when the quality is high, the desired outcome can be absent, due to other factors as the political situation, absence of funding etc.

Framework

The framework used for identification of output and outcome indicators is derived from the Value for Money Analysis (VMA). One starts a production process with a **budget**. With the budget **inputs** are bought, usually manpower and materials. With the inputs certain **outputs** are produced: products and services or activities. The outputs lead to **outcomes**. In general that is a satisfied customer. In

this case the customer (the GEF Council) is satisfied when there are observable changes in development conditions.

Process indicators are indicators, which measure the budget, inputs, outputs and outcomes, or the relationships between them. The most important relationships are:

(a) inputs/budget – an indicator for the **economy** of the process;

(b) outputs/inputs – an indicator for the **efficiency**;

(c) outcome/outputs – an indicator for the **effectiveness**, or quality;

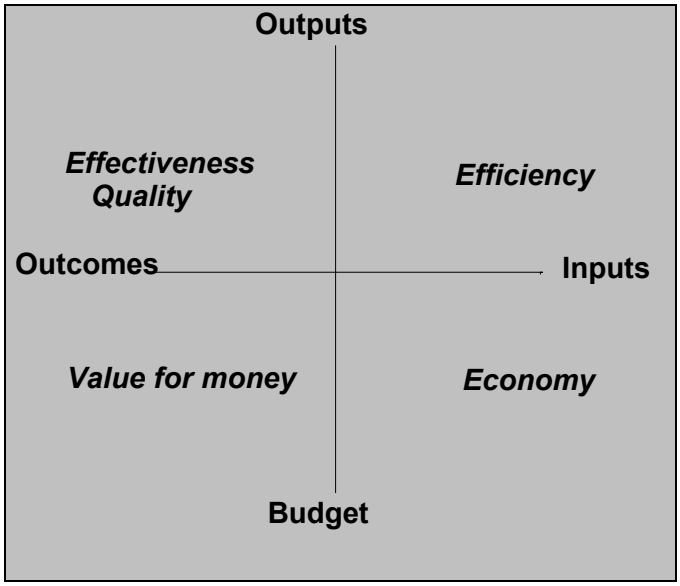
(d) outcome/budget – an indicator for the value for money; it is the product of the aforementioned three indicators. Economy * efficiency * effectiveness = Value for Money.

The framework is presented in box 5.1.

The Value for Money Framework

The Value for Money framework is often used as a help to analyze how a production process is going. Take the example of the baking of bread. The baker starts with a Budget; next he buys flour, hire people to work for him etc. - he buys Inputs. Activities undertaken with help of these inputs lead to Outputs: bread, cake, cookies etc. Once sold this will lead to Value for Money for the customer, or customer satisfaction, and to an income for the baker.

Suppose the baker isn't doing as well as he wants to do; then the question arises where he should focus his attention to improve the situation. Is he, compared to the competition, lacking in Economy, Efficiency or Effectiveness?



In the Result Based Management philosophy, the donor acts like a customer. The focus is on the Outcomes of projects, and the donor compares the Value for Money he gets from different competing projects. The idea is also that this will force the project management to watch carefully the three E's, without direct overview in these respects by the donor.

The tables in **Annex I** present the activities, the related outputs and outcomes and the individual indicators proposed to measure progress and quality.

In Chapter 6 some examples of individual process indicators will be presented in detail with proposals for measuring progress and quality.

In the 1st column of the tables in annex I, it can be indicated whether or not a specific activity has been completed in Phase I. It is possible in principle to do the evaluation of these activities by using the proposed indicators. For those activities that continue in Phase II, it is recommended to apply the process indicators for both Phase I and II at the same time, considering Phase I and II as one project.

5.1.3.2. Stress reduction indicators:

The individual stress reduction indicators, grouped according the 4 defined categories, can be found in **Annex II.** This list is considered a long list from which a core list can be selected (see par 5.1.4).

5.1.3.3. State indicators:

The individual state indicators, grouped according the 4 defined categories, can be found in **Annex III.** This list is considered a long list from which a core list can be selected (see par 5.1.4).

5.1.4. Recommendation for the selection of a core list of indicators for GEF M&E

Process indicators

Annex I presents the long lists for process indicators. In par 6.3 a methodology is presented for the aggregation of individual indicators into one aggregated indicator. In principle, an aggregated indicator for each of the 3 categories, presented in par. 5.1.2.1, which are directly related to the objectives, outputs and outcomes of the DRP, as presented in the LFM, can be produced. Process indicators serve the purpose of M & E for the GEF Council and are part of an internal reporting process. For this purpose, the whole set is necessary and cannot be reduced to a core list. For the purpose of external reporting, it is questionable, whether the results of process indicators should be reported. Certainly aggregated indicators will not have strong external communicative power. The results of a number of activities should be reported externally however. These could include for instance the revision of protocols, the implementation of a small grants programme, the development of the DANUBIS, the implementation of EU Directives and maybe others, to be decided by the GEF team in consultation with the ICPDR Secretariat. This type of external reporting can be done by a narrative in an annual report.

Recommendation 1: it is advised to distinguish internal and external reporting for process indicators. For internal reporting 3 aggregated indicators are recommended; for external reporting narrative reporting is advised for activities to be selected by the GEF Team/ICPDR Secretariat.

Stress reduction indicators

Annex II presents the long lists for stress reduction indicators. There are 22 stress reduction indicators proposed. It is difficult to see how this number can be reduced for internal reporting. Each of the indicators proposed has a direct relation with the assessment of compliance with the Danube River Protection Convention and the JAP and DABLAS. For external use, a core list of indicators with strong communicative power can be proposed.

Recommendation 2: the matrix in annex II presents the recommendation for a core list based on the score for each of the criteria presented in par. 4.5

State indicators

Annex III presents the long lists for state indicators. In this Annex, the full list of the 52 TNMN determinands for water and 22 for sediment should be presented. For reasons of convenience, the TNMN determinands have been grouped in such a way that 18 state indicators are proposed. It is difficult to see how this number can be reduced for internal reporting. Each of the indicators proposed is agreed within the TNMN. For external use, a core list of indicators with strong communicative power can be proposed.

Recommendation 3: the matrix in annex III presents the recommendation for a core list based on the score for each of the criteria presented in par. 4.5.

5.2. System of indicators for WFD/ EEA

5.2.1. Introduction

The proposed selection of categories of indicators and individual indicators for WFD/EEA is presented in this paragraph. The categories of indicators are presented on basis of the DPSIR cycle. The driving force indicators consist of categories of indicators, that present the development in sectors of the economy with pressure on the environment as a result. The pressure indicators present the consequences of economic activities and human interventions on the river and its ecosystem. State indicators are clearly defined. The categories proposed are based on the present structure of the TNMN database. The impact indicators describe the change or loss of functions of the river and its ecosystem. The response indicators are related to implementation of policies; this implies development, implementation and enforcement of policy measures, such as new legislation and regulations, but also investments as a result of policy implementation.

5.2.2. Categories of indicators

5.2.2.1. Driving Force indicators

These categories of indicators should reflect the development in activities in economical sectors, which potentially result in pressures on the environment. OECD used to call driving forces: indirect pressures. EEA did not report on driving force indicators in its latest indicator based assessment of European waters (see ref. 2). Driving forces relate to production and consumption. Traditionally a lot of statistical information is collected on these subjects, including indicators and indexes. There seem to be enough possibilities for the DRP to use the existing information. The following categories have been selected on basis of their direct effects on the environment:

1. Demographic developments
2. Industrial production
3. Agricultural production
4. Transport

5. Energy production

6. Tourism

5.2.2.2. Pressure indicators

These indicators should reflect the environmental consequences for the Danube basin as the result of economic activities and human interventions in the hydrology of the river. They result from the use of the river for discharges, water abstraction, shipping, tourism, electricity production etc. The following categories are proposed:

1. Physical interventions

2. Hazardous pollutant loads

3. Nutrient loads

4. Accidental spills

5. Use of natural resources

5.2.2.3. State indicators

The state indicators should reflect the environmental conditions in the Danube basin. The ICPDR is collecting a vast amount of data on the Danube status. The categories proposed should be based on the information collected at one hand; on the other hand the quality of the ecosystem has to be covered as well. The following categories are the same as proposed for the GEF M & E indicators:

1. Hydrology

2. Water quality

3. Ecological quality

4. Suspended solids/sediment quality

5.2.2.4. Impact indicators

Impact indicators reflect the loss of functions and other damages to the river system. They usually are the result of synergistic effects from different pressures. Impact indicators provide the real signals on deterioration of the system, while state indicators should be regarded "intermediate" indicators. A change of state does not necessarily mean that the ecosystem suffers an impact. Impact indicators should also have a relation with the desired functions of the river system. The following categories are proposed:

1. Loss of habitats

2. Loss of biodiversity

3. Loss of fisheries resources

4. Economical damages

5.2.2.5. Response indicators

These indicators should measure the result of interventions by the Danube countries, that result in reversal of impacts and improvement of the environmental conditions. These interventions are formulated in policy and legal documents as the Danube River Protection Convention, the JAP,

DABLAS and other international and national legal documents and regulations. Such interventions should be followed by investments, which result in a reduction of pollutant loads and/or recovery of the ecosystem. Any policy cannot succeed without stakeholder involvement and sufficient public support. Therefore implementation of programmes for stakeholder involvement and public awareness raising are considered to be responses.

The following categories are proposed:

1. Implementation and enforcement of regional and national legislation and regulations
2. Investments
3. Implementation of stakeholder involvement and public awareness raising programmes

5.2.3. Individual indicators

5.2.3.1. Driving Force indicators

The individual driving force indicators, grouped according the 6 defined categories, can be found in **Annex IV.** This list is considered a long list from which a core list can be selected (see par 5.2.4).

5.2.3.2. Pressure indicators

The individual pressure indicators, grouped according the 5 defined categories, can be found in **Annex V.** This list is considered a long list from which a core list can be selected (see par 5.2.4).

5.2.3.3. State indicators

The individual state indica tors, grouped according the 4 defined categories, can be found in **Annex III** and are the same as for the GEF M & E**.**

5.2.3.4. Impact indicators

The individual impact indicators, grouped according the 4 defined categories, can be found in **Annex VI.** This list is considered a long list from which a core list can be selected (see par 5.2.4).

5.2.3.5. Response indicators

The individual response reduction indicators, grouped according the 3 defined categories, can be found in **Annex II.** The list for WFD/EEA is the same as for GEF M & E with the exception of loads, which are defined as pressures under the DPSIR cycle (see annex V). This list is considered a long list from which a core list can be selected (see par 5.2.4).

5.2.4. Recommendation for the selection of a core list of indicators for the ICPDR

Driving force indicators

Annex IV presents the long list of 19 driving force indicators. Such indicators relate to general demographic and economic developments and are usually collected and reported by the governments in the basin and the EU through Eurostat. There seems no need for the ICPDR to

collect additional information. The long list can be used for internal purposes. For external reporting a core list is recommended.

Recommendation 4: the matrix in annex IV presents the recommendation for a core list based on the score for each of the criteria presented in par. 4.5

Pressure indicators

Annex V presents the long lists for pressure indicators. There are 12 pressure indicators proposed. It is difficult to see how this number can be reduced for internal reporting. Each of the indicators proposed has a direct relation with the assessment of compliance with the Danube River Protection Convention and the JAP and DABLAS. For external use, a core list of indicators with strong communicative power can be proposed.

Recommendation 5: the matrix in annex V presents the recommendation for a core list based on the score for each of the criteria presented in par. 4.5

State indicators

For the recommendation for a core list of state indicators, see annex III and par. 5.1.4. under state reduction indicators.

Impact indicators

Annex VI presents the long lists for impact indicators. There are 7 impact indicators proposed. It is difficult to see how this number can be reduced for internal reporting. Each of the indicators proposed has a direct relation with the assessment of compliance with the Danube River Protection Convention and the JAP and DABLAS. For external use, a core list of indicators with strong communicative power can be proposed.

Recommendation 6: the matrix in annex VI presents the recommendation for a core list based on the score for each of the criteria presented in par. 4.5

Response indicators

For the recommendation for a core list of response indicators, see annex II and par. 5.1.4. under stress reduction indicators.

6. PRESENTATION OF INDICATORS

6.1. Introduction

Selected indicators can be assessed and presented in many ways. In this chapter a number of examples for assessment and presentation techniques will be presented. In par. 6.4 examples of a process indicator, a stress reduction/response indicator, pressure indicators and state indicators will be presented in detail. EEA is working on the application of many indicators which in principle could be relevant for management in the Danube and the Black Sea. A list has been published of 240 of such indicators. For many of these indicators "descriptive sheets" have been developed describing the indicators and the method of assessment and presentation. The indicators have a code, referring to the issue addressed, and a number. For a number of these EEA indicators, the code and the number is given in annexes I-VI. The descriptive sheets can be found on the EEA website. However, EEA is now considering to make a core list of 37 environmental indicators, only some of them for water (see ref. 10). This list is expected to be published at the end of March 2004. It is not clear yet, what will happen with the descriptive sheets.

The GEF-DRP and the GEF-BSERP are fully familiar with the well known techniques of assessment and presentation of many indicators, in particular for pressures, state and impact. They are reported in the TNMN Yearbooks and in the Black Sea Status and Trend reports. Usually these indicators are presented by graphs, histograms, pies and maps. There is no need to present these techniques here again. Other frequently used assessment and presentation techniques are the spider web presentation, the kite diagram (see ref. 4) and the "mondriaan" (a matrix with colours indicating scores). It is also possible to present different indicators in one graph, eg loads and concentrations (see ref. 3).

Many good examples of presentation of indicators can be found in the report: Environmental indicators in Latvia, 2002 (see ref. 3, and website: www.lva.gov.lv) from which a number of presentations have been copied.

6.2. 6.2 Examples of individual indicators

6.2.1. 6.2.1 Driving force indicators

Two examples are presented from ref. 3: Water consumption in different sectors, 1991-2000, and life stock patterns, 1990-2000.

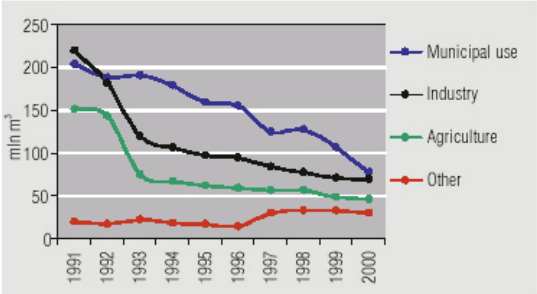


Figure 12.1. Water consumption in economic sectors, 1991-2000
Source: Latvian Environment Agency

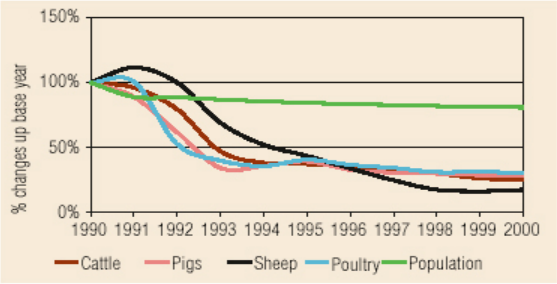


Figure 3.30. Agricultural parameters (livestock and poultry numbers) in relation to the population of Latvia, 1990-2000
Source: Central Statistical Bureau

6.2.2. Pressure indicators

One example is presented from ref. 3: Water abstraction, 1991-2000 and two examples from ref. 15: loads of inorganic nitrogen and phosphorous.

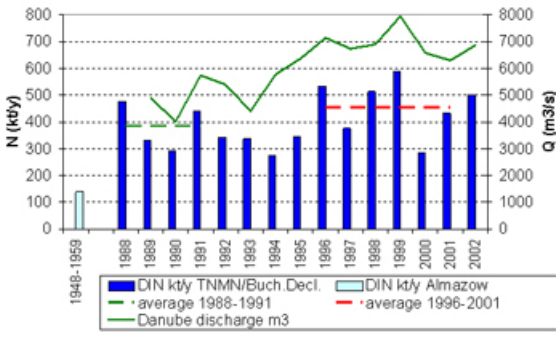


Figure 1: Historical development of the Danube River load of Inorganic Nitrogen.

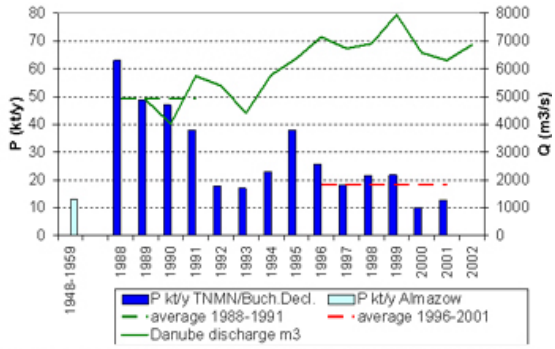


Figure 2: Historical development of the Danube River load of Phosphorus.

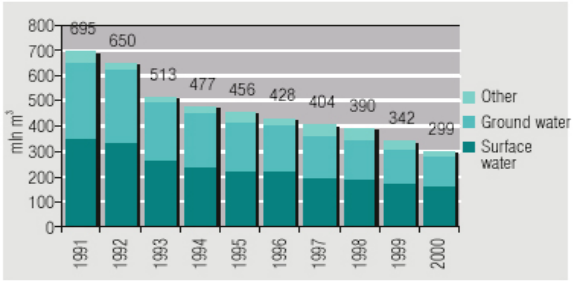


Figure 12.2. Water abstraction, 1991-2000
Note: Other water - quarry and rain water
Source: Latvian Environment Agency

6.2.3. State indicators

Two examples are presented from ref. 3: Oxygen concentrations in the bottom layer of the Gulf of Riga, 1973-2000, and mean yearly nitrogen concentration in the Daugava River (at Piedruja, border with Belarus), 1994-2000

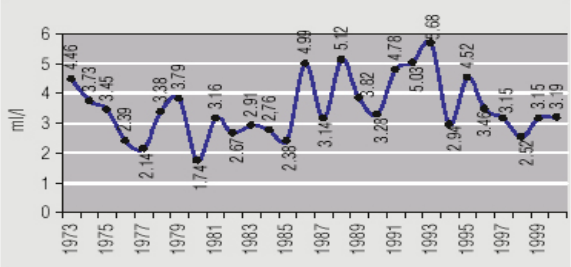


Figure 9.30. Oxygen concentrations in the bottom layer of the Gulf of Riga,1973-2000
Source: Institute of Aquatic Ecology, University of Latvia

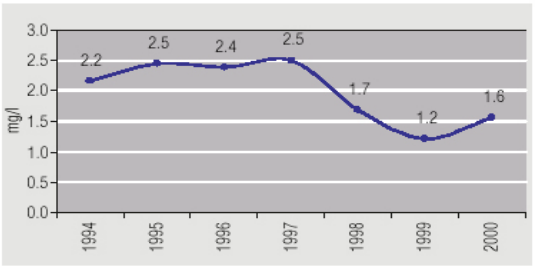


Figure 10.3. Mean yearly total nitrogen concentration in the Daugava River (at Piedruja, border with Belarus), 1994-2000
Source: Latvian Hydrometeorological Agency

6.2.4. Impact indicators

One example is presented from ref. 3: Saprobiological quality of small rivers, 1998-2000

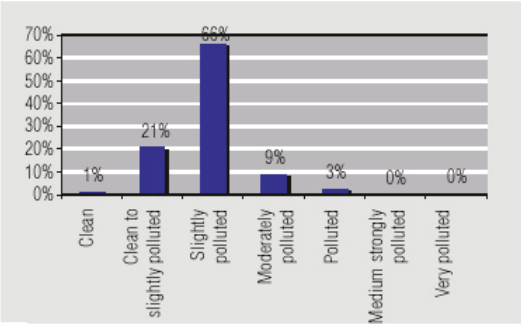


Figure 9.4. Saprobiological quality of small rivers, 1998-2000
Source: Latvian Environment Agency

6.2.5. Stress reduction/response indicators

Two examples are given from ref. 3: Number and area of certified biological farms in Latvia and coverage of particularly protected nature territories in Latvia, 1960-2000.

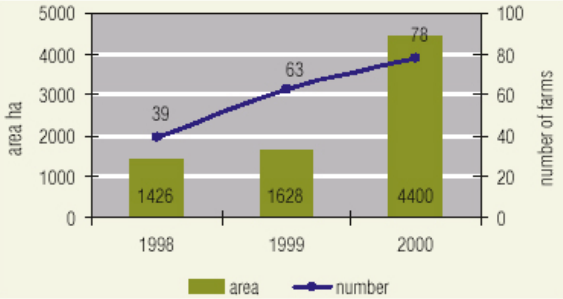


Figure 16.7. Number and area of certified biological farms in Latvia
Source: Association of Latvian Biological Agriculture Organizations

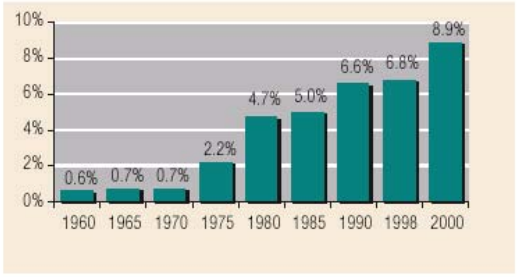
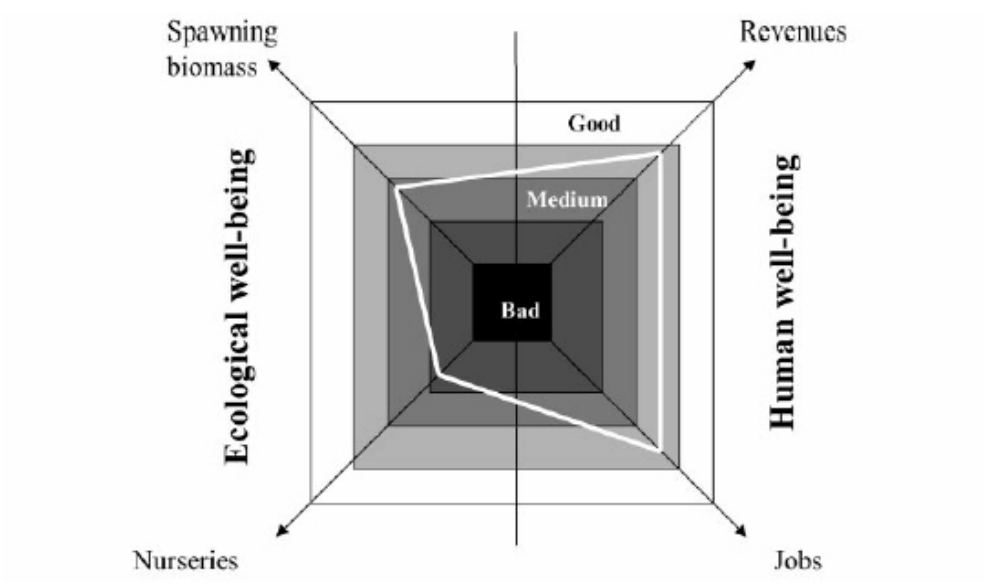


Figure 4.4. Coverage of particularly protected nature territories in Latvia, 1960-2000
Source: Latvian Environment Agency
Note: not including the North Vidzeme Biosphere Reserve

6.2.6. Aggregated indicators: the kite diagram

An example of an aggregated indicator is found in ref. 14. The figure is copied from this article. Proposals for aggregated indicators can only be developed after a decision on individual indicators has been made. This example is on fishery, but similar presentations can be made for other sectors like agriculture and tourism.



Note: The scale for each criterion,from "Bad" to "Good",is indicated by the degree of shading

6.3. Clustering and aggregation of indicators

6.3.1. Introduction

Very often in a project there are so many, and so detailed, indicators available that there is the risk of losing manageability, overview and clarity. In this case there is a need for simplification. This can be done by selecting indicators, and by aggregating them. Selection is a common procedure; the process of reducing the number of indicators in which the EEA is presently involved is a clear example. The selection of a flagship species as a key indicator is also a well known procedure. The indicators that finally found their place in this report are also the result of a selection process.

Aggregation of indicators seems to be less common. There are some exceptions: an index as the saprobiotic index is well known; another example is an indicator as the Biological Oxygen Demand (BOD) which in fact is the aggregate of a large number of (partly unknown) chains of reactions. One of the reasons for reluctance to aggregate data seems to be the fear to land in a quagmire of discussions about assigning weights to variables. However, as will be shown, a correct clustering and aggregation procedure mainly bypasses the whole issue of weights.

In the social sciences, especially in economics, aggregation is a standard procedure (see ref. 18). No one can handle for example an input-output model of the size 800*800. Aggregation of sectors till a 6*6 model is reached, or even a one-sector model, is the solution. Other examples of aggregated quantities are index numbers, the representative firm or consumer, market segments etc.

The purpose of this note is to introduce some concepts and to show how aggregation can work. The focus is on aggregation as a tool for achieving manageability and clarity, by organizing data in a hierarchy. Its use thus is mainly one of helping to make management and policy decisions, and as a tool for reporting.

Aggregation in this case is done *ex post,* after the data are collected. This means that the procedure is principle harmless: one can always opt for another procedure if the aggregation doesn't meet its objective.

6.3.2. Consistent aggregation and filtered consistency

In aggregation *micro variables* are aggregated by an *aggregation function* into *macro variables.* This is usually done by first *grouping* or *clustering* micro variables, and next performing some operation on these clusters (taking the mean for example) to construct one macro variable for the group. The aggregation is, loosely defined, called *totally consistent* if all relations that hold for a set of micro variables also hold for the corresponding set of macro variables (see ref. 19). The behavior of the micro system can in that case be completely identified with the behavior of the macro system. A simple example: if the reduction of emission of 2531 chemical substances is exactly the same, say 34,12% for all 2531, then the aggregation of those 2531 data into one indicator ("reduction of emission is 34.12%") is totally consistent.

If the consistency is not total, aggregation means loss of information. Each aggregation has a *loss function*; generally that aggregation scheme that minimizes the loss function is considered the optimal scheme.

Total consistency is rare. For policy and management purposes it is also not a very useful concept. The basic question here is if a decision reached on basis of the aggregated macro system is the same as the decision based on using the micro system. If that is the case, the aggregation is

partially consistent. More precisely, in this case the aggregation fulfills the conditions of *filtered consistency,* where the decision acts like a filtering device.

In fact, taking a decision normally means that the decision maker inevitably will aggregate data, although most of the time implicitly. The reason is that the decision space normally had far fewer dimensions than the data space. Take, as an example, the decision whether a new wastewater treatment plant should be built. On a policy level the decision space has only two dimensions: (1) Where? and (2) How big? (with a choice for the coordinates {0,0} if the decision is not to build). On a management level the decision space, about for example the design of the WWTP, will have more dimensions (Which type?) but it is very unlikely that it will be of the same order as the data space. For this reason decisions will be very often quite *insensitive* to the aggregation scheme, or in other words, *robust* with respect to it.

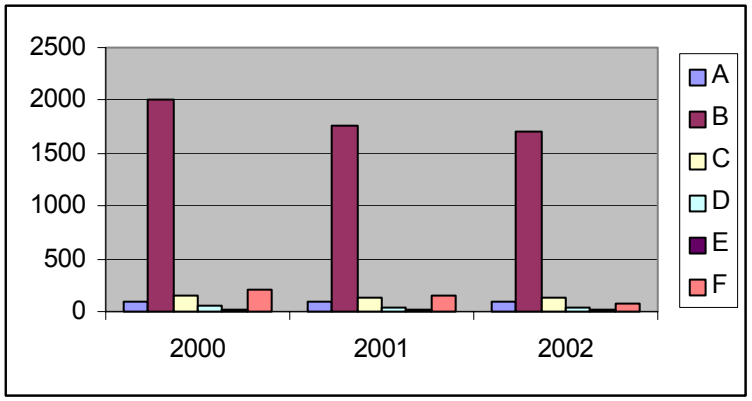
6.3.3. An example of clustering and aggregation

To get the flavor of clustering and aggregation, consider the following simple example. Suppose that in a project loads in a river are reduced. The management of the project wants to inform the sponsors about the results; there are data about loads of six substances (A-F), during three years, as summarized in Table 1 and Figure 1.

Table 1: Loads of six substances, in kton/yr

Substance	Yr 2000	Yr 2001	Yr 2002
A	100	90	87
B	2000	1760	1700
C	150	138	126
D	50	40	35
E	20	13	19
F	200	156	72

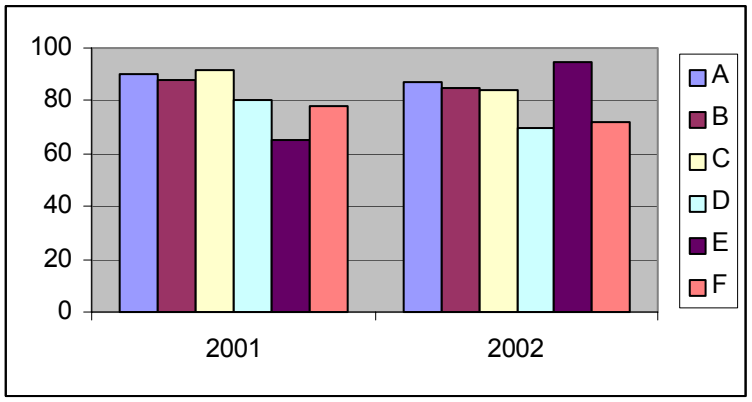
Figure 1: Loads of six substances, in kton/yr



The picture that emerges from these data as presented is not very clear; the only conclusion that can be inferred seems to be "*As can be seen in Figure 1, there is in all cases some reduction*."

If we normalize the data, by setting the loads in the year 2000 on 100, the picture becomes slightly more clear (see Figure 2, although we have to look careful.

Figure 2: Loads of six substances, in percentages relative to yr 2000



The conclusion could be: "As can be seen in Figure 2, the loads are reduced till around 80% of the level of 2000."

However, the moment we express a reduction as an average number we run the risk of getting swamped in a quagmire of discussions about weights: how should we weight in 2002 a reduction of 1 kton, or 5%, of substance F, to a reduction of 300 kton, or 15% of substance B? Usually there are as many opinions as participants in the discussion – that ends also usually without any clear conclusion.

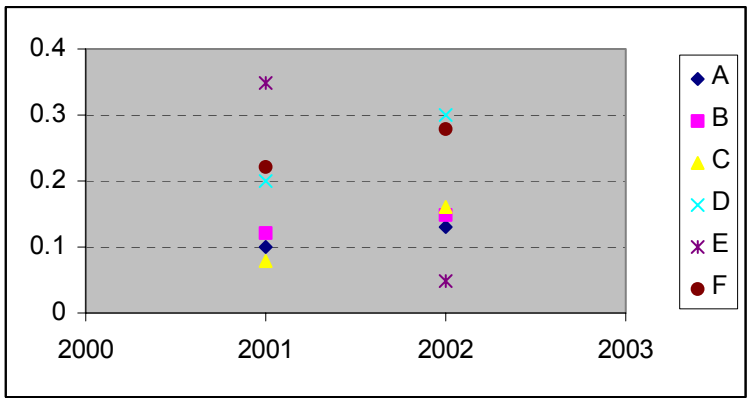
Clustering of the data can help us to get around that quagmire.

As a first step, in Table 2 and Figure 3 the data for reduction are presented.

Table 2: Reduction of loads in per units, base year 2000

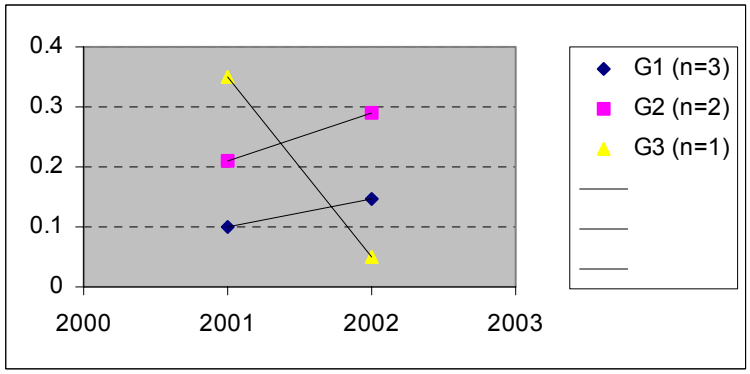
Substance	Yr 2001	Yr 2002
A	0.10	0.12
B	0.12	0.15
C	0.08	0.18
D	0.20	0.30
E	0.05	0.35
F	0.22	0.28

Figure 3: Relative reduction of loads for six substances, base year 2000



In this case, a simple visual inspection (see Figure 1) leads to the identification of three groups or clusters: (1) ABC (2) DF and (3) E. The loss of information if we take averages within the clusters will be small. Note that the question whether we should take some kind of weighted average is not very relevant, as the differences within the clusters are quite small. Once clustered, we end up with Figure 4:

Figure 4: Relative reduction of loads for clusters of substances, base year 2000



Now a clear conclusion can be drawn: "As can be seen in Figure 4, the reduction of the loads is in most cases in the order of 20%, with a rising trend, with the exception of cluster 3, consisting of the substance E."

Some policy and management questions now can be answered ("Are the results of the project satisfactory? Should we do more?"), and other questions can be formulated ("Why is substance E behaving different from the rest? What's the reason of the difference between cluster ABC and cluster DF? Where should we concentrate efforts?" Questions, which perhaps can be answered by going back to the basic data.

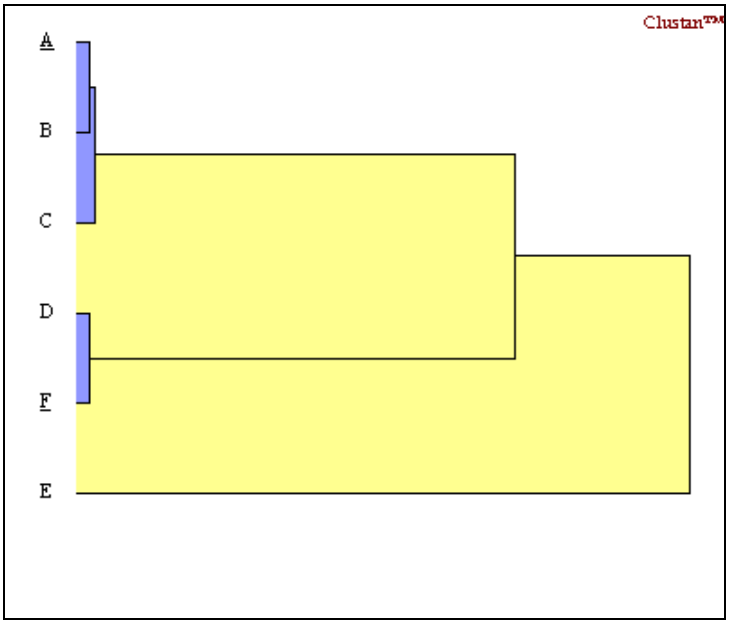
6.3.4. The technique of clustering

In the example above, we arrived at three clusters by visual inspection of a scatter diagram. The case is quite simple: six variables, two dates, one dimension (the relative reduction). In practice cases will be complicated, involving for example several hundred variables, ten years, and several

dimensions (add for example *quantity* and *harmfulness* as dimensions to take into consideration as clustering criteria). In such cases it is of course necessary to us a computer program.

A clustering computer program is usually based on a *hierarchical clustering procedure.* Clusters are formed stepwise, beginning with pairs of cases that are near to each other, using in general a squared distance criterion. Next other cases are added. As clusters grow, the loss of information will become bigger. In Figure 5 this procedure is illustrated with a *clustering tree* for the example presented above, using the program *ClustanGraphics* (see ref. 20).

Figure 5: Clustering tree for reduction of loads for six substances (A-F)



On the vertical axis the substances A-F are shown; going to the right the way they are clustered can be seen. First A/B and D/F are clustered, next C is added to the cluster AB, etc. The criterion for the ordering of the steps is minimization of loss of information as a consequence of the formation of the cluster. That loss is based in this case on the sum of the squared distances of the members of a cluster to the mean of that cluster. The loss of information is shown horizontally. As can be seen the formation of first the first two clustering steps (AB and DF), and the second clustering, the addition of C to AB, barely lead to a loss of information. In the next step - the clustering of ABC and DF to ABCDF -the loss of information would increase hugely, so it seems wise to stop with three clusters; ABC, DF and E; for this reason they are shaded blue, while the not performed clustering is shaded yellow.

6.3.5. Aggregating process indicators

In this report three groups of process indicators are distinguished: (1) *Institutional* (2) *Policy* and (3) *Public Participation* indicators. As there are at present no data available, it is of course completely unclear if the indicators will show a cluster like behavior that will conform to this grouping. One should simply try and see. The only precondition is a normalization of the indicators, for example on a scale of 0-5 (see also Annex VIII).

6.4. Detailed presentation of selected indicators

6.4.1. Process indicator: assessment of involvement

In annex VII a detailed methodology for the assessment of stakeholder involvement is presented. It is presented here as a process indicator, which is used in the context of project performance assessment. However, assessment of stakeholder involvement is equally relevant as a stress reduction/response indicator in the context of policy development and implementation.

6.4.2. Stress reduction/response indicator: introduction of BAP and implementation of Nitrate Directive

In annex VIII a detailed methodology for the assessment of a stress reduction/response indicator is presented, using the implementation of the EU Nitrate Directive as an example. EEA has presented a methodology in a descriptive sheet: AGRI17 (annex XI). The methodology is based on the structure of the Directive and the descriptive sheet AGRI17 with some adaptations.

6.4.3. State indicators: trend analysis of concentrations for 1996-2000 for ammonium and nitrate at 5 stations in the Danube basin

Statistical trend analysis for concentrations result in a quantified assessment of the trends in a state indicator, eg the concentration of a specific pollutant, over a defined period of time at a specific location. There are several software packages which in principle are suitable to be used. A number of examples is presented here, calculated with SPSS. In this procedure data are checked for seasonal patterns and outliers, and linear regression is calculated. The software calculates on basis of these fits the probability of trends and gives a value for the significance. Results are presented for ammonium and nitrate.

As can be seen from Table 3 there is a strong decline of measured ammonium concentrations for all locations, except L0430-L, with reductions up till 78% in five years.

Table 3: Results for Ammonium

Location	T-0	V-0 Period 1	V-end Period 2	Total reduction/ year in %	Average reduction/ year in %	R-square (a)	Signif F (a)	Probability trend for whole period
L0430-L	1996-1	0,33	0,36	-11%	-2%	0,028	0,6691	-
L1220-L	1999-1	0,24	0,06	73%	36%	(0,451)	(0,0005)	Very strong
L1290-M	1996-1	0,14	0,03	76%	15%	(0,497)	(0,0000)	Very strong
L1330-R	1996-2	0,20	0,09	55%	11%	(0,376)	(0,0000)	Very strong
L1390-L	1996-2	0,16	0,06	60%	12%	(0,439)	(0,0000)	Very strong

As calculated for linear regression over the whole period; figures between brackets are for fits for the whole periods, where the distinction in two periods is more relevant.

The graph for location L0430 is presented in figure 6 and for location L1290 in figure 7.

Figure 6: Ammonium concentration at station L0430 (RO05) for the period 1996-2000

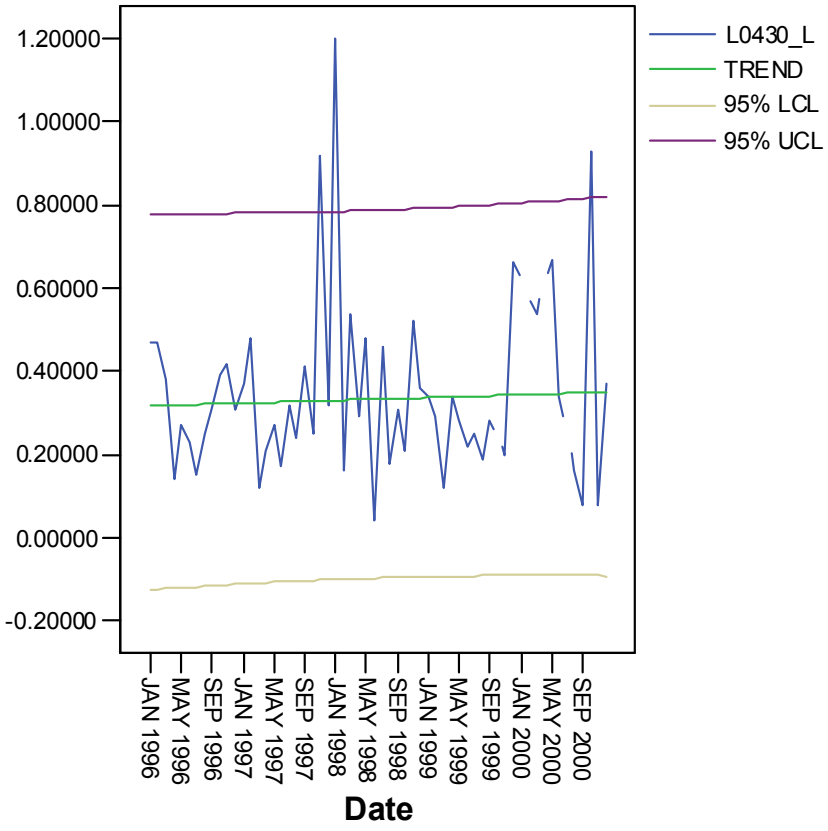
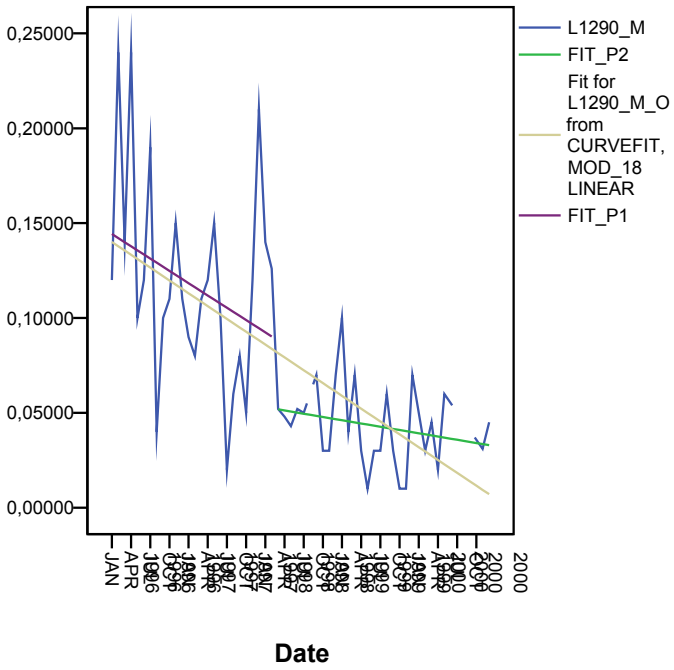


Figure 7: Ammonium concentration at station L1290 (HR03) for the period 1996-2000



L1290_M

As can be seen from Table 4, the concentration of NO3 was reduced for all locations.

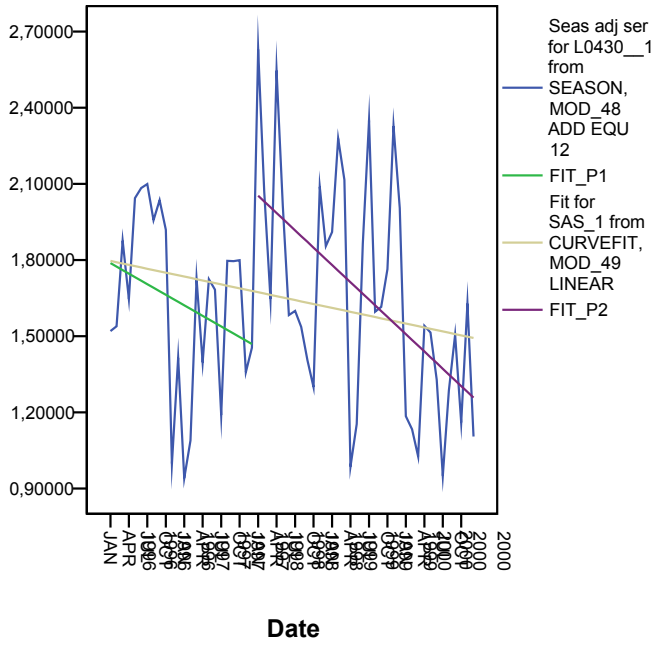
Table 4: Results for NO3

Location	T-0	V-0	V-end	Total reduction/ year in %	Average reduction/ year in %	R-square	Signif F	Probability
L0430-L	1996-1	1,79	1,26	30%	6%	0,22	0,097	Strong
L1220-L	1999-1	2,25	1,53	32%	32%	0,18	0,04	Moderate
L1290-M	1997-7	1,53	1,09	29%	8%	0,42	0,0000	Very strong
L1330-R	1996-2	1,52	1,36	11%	3%	0,10	0,02	Moderate
L1390-L	1996-1	1,31	0,96	27%	8%	0,40	0,0014	Very strong

The graph for location L0430 is presented in figure 8.

Figure 8: Nitrate concentration at station L0430 (RO05) for the period 1996-2000

L0430-L



It should be stressed that the statistical analysis does not give an answer on the reasons for the trends. It could be a real chnage of water quality; it could also be a (sudden) change in the analytical techniques used in the laboratory.

6.4.4. An Indicator for Legal Reform Processes

6.4.4.1. Introduction

The purpose of this short note is mainly to draw attention to a technique for measuring stages of the legal reform process, developed by USAID (ref. 16). The process of reform is broken down in eight milestone events (see Box 1).

Box 1: Outline of USAID milestone model for legal reform (ref. 16)

Stages in legislation:

1. Interested groups propose that legislation is needed
2. Issue is introduced in the relevant legislative committee or ministry
3. Legislation is drafted by relevant legislative committee or ministry
4. The legislature debates the legislation
5. Legislation is passed fully by full approval process needed in legislature
6. The executive branch approves the legislation (where necessary)
7. Implementing action are taken
8. No immediate need identified for amendments to the law

By simply counting the number of milestones taken one can assess the state of affairs concerning legislation in a field in a country.

6.4.4.2. Presentation

The presentation of the results can be done in a number of ways, e.g.:

- Spider web for a specific field of legislation, with the countries on the axes, to get an overview of the situation in this field in the different countries;
- Spider web for a country, with the fields of legislation on the axes, to get an overview of the situation in a country;
- The same principle as above, but now not the absolute number of milestones taken, but the **extra** number of milestones taken since the year before, to get an overview of the progress made;
- Matrices, with on the rows the fields of legislation and on the columns the countries.

Of course results can be aggregated, by constructing indices or calculating averages.

6.5. Web site format report

The idea we had for the website is that indicators can be kept up to date at all times. This gives a better idea of the current situations and it is easier to see progress. That's why there was need for a management tool which could create graphs from input given to the website. This way the information that the graphs present is always the current one, unlike reports on paper.

The website is created with XHTML, which is the new standard for websites because it gives clean and correct code. It also has the advantage of working on all web browsers correctly. Used with the wc3 validator the XHTML is fully bug proof. The code behind the management tool is PHP in use with a GD library to create the dynamic graphs. Because this website is still only a prototype which needs to have other functions and more indicators added, we created a way to have it completely dynamic. In this way modules can be added and removed in an easy way. This is achieved by using a simple directory structure which divides the whole website in chapters. The way the website looks can be easily adjusted as well with a cascading style sheet.

In order to change the input for the indicators there is a login page required which will lead to the management tool. Users with the given rights will be able to login on this page and change or update the certain indicators and the graphs will dynamically convert this input into a new graph.

7. DISCUSSION

In this report, a proposal for an indicator system for GEF M & E is presented. The main issues to discuss have been formulated in chapter 5. Final decisions on a long list and core list depend on answers to these questions and should primarily be taken by the end users. At the same time, the use of indicators in water management is topic of an ongoing debate in the EU and the EEA (see ref. 10). Also for GEF M & E this debate is relevant, since indicators systems for either GEF or EU should preferably be harmonized. It is at present not clear what the outcome of the EU debate will be although answers are expected in the near future. EEA will probably present methodologies for quantification and presentation of the selected list of indicators. A beginning has been made already with the production of these descriptive sheets.

EEA has chosen in its recent report (see ref. 12 and par. 4.1) to use the DPSIR cycle in the context of issues: eutrofication, pollution with hazardous substances etc. For GEF M & E this question seems not to be relevant. For policy compliance assessment this approach has advantages. The proposed system for stress reduction and state indicators in this report could be rearranged on an issue basis. Many indicators are related to different issues and thus should be reported under a number of issues. The choice for a yes/no issue related presentation could be taken after the final list of core indicators has been chosen. Finally, the use of aggregated indicators should be investigated also after some of these questions have been answered.

8. LITERATURE AND WEBSITES

Literature

1. Guidance for the analysis of pressures and impacts in accordance with the Water Framework Directive, EU Impress working group, page 15, November 2002.
2. EEA, Europe's water: an indicator based assessment, Topic Report 1/2003, November 2003.
3. Latvian Environment Agency, Environmental indicators in Latvia, 2002
4. Monitoring and Evaluation Indicators for GEF International Waters Project, Monitoring and Evaluation Working Paper 10, Al Duda, November 2002
5. OECD, OECD Core set of indicators for environmental performance reviews, Environment Monographs, no. 83, 1993
6. UNEP, An overview of environmental indicators: state of the art and perspectives, UNEP/EATR.94-01, 1994
7. RIVM, Towards a global environmental outlook II: scanning the global environment, designing a framework for UNEP's reporting functions, 1994
8. EEA, Environment in the European Union at the turn of the century, 1999
9. Guidelines on Monitoring and Assessment of Transboundary Rivers, UN-ECE Task Force on Monitoring and Assessment, page 22, March 2000
10. EEA, Internal document, Doc.EEA/BU/32/06, EEA Core set of indicators, 2004
11. Draft for Discussion at the second biennial GEF International Waters Conference, Dalian, China, September 25-29, 2002, by the GEF International Waters Program Indicators Steering Group
12. GEF, Monitoring and Evaluation Polices and Procedures, Global Environment Facility, Washington DC, 2002
13. OECD, Environmental Indicators: towards sustainable development, 2001
14. S.M. Garcia et al., The FAO guidelines for the development and use of indicators for sustainable development of marine capture fisheries and an Australian example of their application, Ocean and Coastal Management, 43, 537-556, 2000
15. Nutrients as a transboundary Pressure in the DRB, ICPDR-UNDP/GEF, February 2004
16. USAID, *Monitoring the Policy Reform Process*, Recent Practices in Monitoring and Evaluation Tips, 2000, Number 14.
17. S.O. Funtowicz et al., Information tools for environmental policy under conditions of complexity, EEA, 1999
18. W.D. Fisher, *Clustering and Aggregation in Economics*, The John Hopkins Press, Baltimore, 1969.
19. Y. Ijiri, "Fundamental Queries in Aggregation Theory", *Journal of the American Statistical Association,* December 1971*,* Vol. 66, 766-782.
20. D. Wishart, *ClustanGraphics*, Edinburgh, 1999 (software package).

Websites:

BSC: bsc-commission.org

BSERP: blacksea-environment.org

ICPDR: icpdr.org

EEA: eea.eu.int

EU: europe.eu.int

OECD: oecd.org

GEF: gefweb.org

WB: worldbank.org

Latvia: lva.gov.lv

ANNEX I: Process indicators

1. Consolidation and operation of institutional mechanisms for cooperation under the ICPDR

Ph2	Outputs	Indicators	***Outcome***	Indicators
1.1	Diverse tools and mechanisms for River Basin Management	Assessment quality by ICPDR	ICPDR capacity strengthened	Assessment stakeholders
2.1	Proposals for reinforcement Interministerial Committees	Breadth involvement departments, local administrations and other organzations	Coordination national actvities	Scope activities; assessment stakeholders
2.2	Operational tools for monitoring, laboratory and information management and for emission analysis	Harmonization standards; Development EMIS/MLIM andTNMN	Monitoring in line with EU standards	Peer assessment
4.1	Proposal for Monitoring Programme	Accordancy to EU requirements	Monitoring programme operational	Monitoring institutions in all Danube countries operational; adherence to QA/QC procedures
4.2	Analysis of sediments in the Iron Gate reservoir and impact assessment of heavy metals and other substances on the Danube and the Black Sea ecosystems	Peer assessment quality reporting	Increased understanding	Recommendations for precautionary and rehabilitation measures in the period 2006-2015; Assessment stakeholders of the quality of measures
4.3	Monitoring and asssessment of nutrient removal capacities of riverine wetlands	Assessment in 2 Danube wetland/floodplain sites; Peer review quality assessment	Agreement on DRB wetland management plan	Assessment stakeholders
2.3	Proposals for improvement of procedures and tools for accident emergency response with particular attention to transboundary emergency situations	Assessment stakeholders.	Swift and coordinated reponse to accidents	Results simulation
2.3	Check-list for reduction of risk of accidents	Completeness (peer assessment)	Implementation in 50 industrial locations/companies	Reduction accidents Dissemenation results
2.5	Coordination activities BSERP & DRP	Formulation common management objectives	Common activities	Assessment stakeholders
2.6	Workshops on nutrient reduction and transboundary issues	Participants: 130 experts, 300 stakeholder representatives	Enhanced capacities	(Self-)assessment

2. Development of policy guidelines and legal and institutional instruments

Ph2	Outputs	Indicators	***Outcome***	Indicators
1.1	Danube River Basin Management Plan	Accordancy to EU Directives etc ; Involvement governments and other stakeholders, as assessed by these stakeholders and ICPDR	Acceptance by ICPDR and individual governments; Better understanding of planning approaches as prescribed by EU-WFD	Review/approval/ratification; Self-assessment
1.1	Sub-basin management plan for Sava Basin	Accordancy to EU directives etc.; Involvement governments and other stakeholders, as assessed by these stakeholders and ICPDR	Pilot project Sava started	Assessment by stakeholders
1.2	Proposals for BAP	Assessment stakeholders; Involvement governments and other stakeholders, as assessed by these stakeholders and ICPDR	Adoption BAP in national policy.	Application in basin zones; assessment by stakeholders; dissemenation results
1.3	Pilot project BAP	5 pilot sites selected	100 farmers applying BAP Demonstration BAP	Dissemenation results (1000 farmers are aware of BAP, as Shown by polling.
1.4	Proposals for land use policy for wetland rehabilitation	Scope plan (including legal, and economic issues) Involvement governments and other stakeholders, as assessed by these stakeholders and ICPDR	Start pilot projects land use	See with Pilot projects land use
1.4	Pilot projects land use	3 pilot-sites in 3 countries, 7000 ha.	Demonstration land use Enhanced capacities stakeholders	Dissemenation results (Self-)assessment
1.5	Proposals for BAT in industrial and transport sectors according to EU directives	Assessment stakeholders Involvement governments and other stakeholders, as assessed by these stakeholders and PIU	Increased awareness of, and knowlede about potentials BAT	Number of experts trained. Selfassessment by participants workshops

Ph2	Outputs	Indicators	***Outcome***	Indicators
1.6	Proposals for application of economic instruments for control of nutrients and dangerous substances	Assessment stakeholders Involvement governments and other stakeholders, as assessed by these stakeholders and PIU	Increased awareness of policy options	(1)Policy reforms aimed at improved collection of water and wastewater service tariffs and fees considered at the municipal level in 40 municipalities and adopted at the municipal level in 20 municipalities. (2) 60 municipal water systems actively consider tariff reforms aimed at improving sustainable financing; 20 municipalities adopt such reforms. (3) 100 municipalities water and wastewater utilities understand the way in which computerized financial models can be used to assess the financial and service consequences of policy reforms, budget allocations, tariff changes, and development plans,40 municipalities actively use such a model to assess and support new tariff proposals, budget requests, or investment or grant applications.
1.7	Proposals of effective systems of water pollution charges, fines and incentives, focusing on nutrients and dangerous substances	Assessment stakeholders Involvement governments and other stakeholders, as assessed by these stakeholders and PIU	Implementation Demonstration	(1) Ministries or affected agencies of 3 DRB countries and 6 selected demonstration municipalities have used financial modeling to test the consequences of possible reforms in the design of their effluent charges. (2) Ministries or affected agencies of 3 DRB countries are actively considering changing their emission charges to encourage reduction in nutrients and toxics. Dissemenation results
1.8	Recommendations for the reduction of phosphorus in detergents	Assessment stakeholders Involvement governments and other stakeholders, as assessed by these stakeholders and PIU	Agreement on the phase-out of phosphates	24% reduction of P from point sources of pollution; 12% reduction of total P loads from the DRB to the Black Sea
4.4	Workshop on pollution trading and corresponding economic instruments	Participation of policy makers, regulators, polluters and investors	Better understanding instruments	Self-assessment participants

3.. Strenghening of public participation

Ph2	Outputs	Indicators	***Outcome***	Indicators
2.4	Reinforcement DANUBIS and project website	Establishment linkages Opinion expert users Opinion visitors	Enlarged set of users; intensification usage	8000 hits/month in 2006 for DANUBIS 8000 hits/month in 2006 for project website
3.1	Advice for and training of DEF management	Persondays, participants training	Sustainable DEF secretariat	Expansion network; assessment by NGO's of quality DEF
3.1	Support for NGO's by regional consultation meetings and stakeholder training	Particpation in workshps; assessment quality by participants	Improvement capacities	Enhanded cooperation between governments and NGO as assessed by parties; improved capacity for fundraising ($$)
3.1	Support for NGO publications	Number, distribution	Increased awarenees with the public	Public polling
3.2	Small Grants Programme	Number : 120 on nutrient pollution and toxic substance problems and 12, involving 35 NGO's, on transboundary prblems, scope, activities	Increased awareness with the public; capacity building with NGO's	Public polling;
3.3	Information for mass media; organization Danube Day	Frequency and number of publications/broadcasts; scope subjects	Increased awarenees with the public	Public polling; participation organizations in Danube Day
3.4	Proposals for enhancing access to information re hot spots, in accordance with EU WFD and Arhus convention	Involvement of 100 governmental officials and 100 key stakeholders	Access to information Pollution reduction process initiated	Trial procedures 5 pilot sites

ANNEX II: Stress reduction and response indicators

Indicators in bold are proposed for the core set

1. Implementation and enforcement of regional and national legislation and regulations

1. Implementation of Danube River Protection Convention and Joint Action Programme
2. Implementation of EU Water Framework Directive, 2000/60/EC (WEC08)
3. **Implementation of EU Nitrates Directive, 91/676/EC (WEC08; AGRI06; AGRI17)**
4. **Implementation of EU Urban Waste Water Treatment Directive, 91/271/EC (WEU09;** WEU16; WEC08)
5. Implementation of EU IPPC Directive, 96/61/EC
6. **Introduction of P-free detergents (unit: % market share detergents)**

2. Investments

7. **Investments in canalization and municipal waste water treatment plants (WWTP-M) (WEU09; WEU16)**
8. **Investments in agricultural point sources**
9. Investments in industrial waste water treatment plants (WWTP-I)
10. Investments in clean technology (BAT)
11. Investments in wetland restoration
12. Investments in safe shipping and navigation and pollution abatement equipment

3. Reduction of pollutant loads

13. Reduction of organic pollution loads by sector (WEU08)
14. Reduction of nitrogen loads by sector (WEU06)
15. Reduction of phosphorous loads by sector (WEU06)
16. Reduction of BOD5 loads by sector (WEU05)
17. **Reduction of accidental spills**
18. Reduction of metal loads by sector (WHS08; WHS09)
19. Reduction of organic micropollutant loads by sector (WHS08; WHS09)
20. **Reduction of bacteriological and viral pollution by sector (WEU11)**

4. Implementation of stakeholder involvement and public awareness raising programmes

21. Implementation of Aarhus Convention

22. Implementation of art. 14 of the EU Water Framework Directive, 2000/60/EC (WEC08)

This annex shows the proposed individual response indicators under the DPSIR cycle as well with the exception of category 3: loads, since loads in the DPSIR cycle are under pressure indicators (see annex V)

Recommended core list of stress reduction and response indicators

	Policy relevant	Analytically sound and robust	Strong communicative power	Core list
Indicator number				
1				
2				
3				YES
4				YES
5				
6				YES
7				YES
8				YES
9				YES
10				
11				YES
12				YES
13				
14				YES
15				YES
16				
17				YES
18				
19				
20				YES
21				
22				YES

Strong
Moderate
Weak

ANNEX III: State indicators

Indicators in bold are proposed for the core set

1. Hydrology

1. Flow

2. Water availability by sector (WQ01; WQ04)

2. Water quality (WHS02; WHS03; WEU11; WEU12)

3. Oxygen concentration

4. Organic pollution

5. Bacterial pollution

6. Nutrients

7. Metals

8. Organic micropollutants

9. Oil

10. Chlorophyll-a

3. Ecological quality (WEU12; BDIV02; WEC04; WEC05)

11. Saprobic index

12. Flagship species

13. Protected areas (BDIV06; BDIV12; WEC03, a and b: aquatic habitat quality; TELC05: landscape diversity)

4. Suspended solids/sediment quality

14. Organic nitrogen

15. Ptot

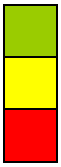
16. Metals

17. Organic micropollutants

18. Oil

Recommended core list of state indicators

	Policy relevant	Analytically sound and robust	Strong communicative power	Core list
Indicator number				
1				YES
2				YES
3				YES
4				
5				YES
6				YES
7				
8				
9				
10				
11				YES
12				YES
13				YES
14				
15				
16				
17				
18				



Strong

Moderate

Weak

ANNEX IV: Driving Force indicators

Indicators in bold are proposed for the core set

1. Demographic developments

1. Population growth (unit: %)

2. Water demand (WQ2; unit: volume per capita)

3. Number of households (unit: number)

2. Industrial production

4. Production growth by branch (unit: %)

5. Use of raw materials (unit: tons)

6. Water demand (WQ2; unit: volume per ton produced)

7. Employment and revenue (unit: Euro)

3. Agricultural production

8. Cropping/Livestock patterns (AGRI09; units: areas, numbers)

9. Fertilizer consumption (AGRI07; tons)

10. Pesticides and herbicides consumption (AGRI08; tons active compound)

11. Water demand (WQ2; AGRI01; unit: volume per ton produced)

12. Employment and revenue (unit: Euro)

4. Transport

13. Industrial and agricultural production

14. Employment and revenue (unit: Euro)

15. Road versus rail versus shipping

5. Energy production

16. Water demand (WQ2; unit: volume)

17. Employment and revenue (unit: Euro)

6. Tourism

18. Water demand (WQ2; unit : volume per capita)

19. Employment and revenue (unit: Euro)

Recommended core list of driving force indicators

	Policy relevant	Analytically sound and robust	Strong communicative power	Core list
Indicator number				
1				YES
2				YES
3				
4				
5				
6				YES
7				
8				YES
9				YES
10				YES
11				YES
12				
13				
14				
15				YES
16				YES
17				
18				YES
19				

Strong
Moderate
Weak

ANNEX V: Pressure indicators

Indicators in bold are proposed for the core set

1. Physical interventions

1. River corrections
2. Migration barriers/flow impairments (reservoirs, power dams)

2. Hazardous pollutant loads

3. Metal loads by sector (WHS08; WHS09)
4. Organic micropollutant loads by sector (WHS08; WHS09)

5. Bacteriological and viral pollution by sector (WEU11)

3. Nutrient loads

6. Organic pollution loads by sector (WEU08)

7. Nitrogen loads by sector (WEU06)

8. Phosphorous loads by sector (WEU06)

9. BOD5 loads by sector (WEU05)

4. Accidental spills

10. Number of accidental spills

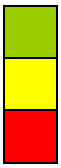
11. Tons of spilled pollutants

5. Use of natural resources

12. Water abstraction by sector (WQ02; AGRI01)

Recommended core list of pressure indicators

	Policy relevant	Analytically sound and robust	Strong communicative power	Core list
Indicator number				
1				YES
2				YES
3				
4				
5				YES
6				YES
7				YES
8				YES
9				YES
10				YES
11				YES
12				YES



Strong

Moderate

Weak

ANNEX VI: Impact indicators

Indicators in bold are proposed for the core set

1. Loss of habitats

1. Areas of wetlands lost (BDIV05; BDIV09)

2. Areas of flood plains lost

2. Loss of biodiversity

3. to be determined

3. *Loss of fisheries resources (unit: numbers, biomass, Euro)*

4. Decrease of commercial species

4. Economical damages (unit: Euro)

5. Costs of flood control

6. Costs of water treatment

7. Reduced options for aquaculture development

Recommended core list of impact indicators

	Policy relevant	Analytically sound and robust	Strong communicative power	Core list
Indicator number				
1				YES
2				YES
3				YES
4				
5				YES
6				
7				

Strong

Moderate

Weak

Annex VII: Methodology for the assessment of stakeholder involvement

Assessment of Involvement

1. Introduction

In the list of process indicators, there is mentioned repeatedly *Assessment* (for example of the quality of workshops by participants) and *Assessment of involvement*. An example of the last indicator is *Involvement governments and other stakeholders in the development of proposals for BAP, as assessed by these stakeholders and the ICPDR*.

Whereas the first type of assessment can be done fairly simple, by way of a short questionnaire, the second type is more complicated. For that reason we elaborate here a (completely fictitious) example.

The way the results are presented can be also of use for the presentation of more simple assessments.

2. Involvement

Involvement refers to the extent that a stakeholder delivers his *necessary contribution*. It is the product of two elements: the extent of necessity, or importance, of the fact that the stakeholder should contribute, and the quality of the contribution.

We define involvement as 'importance that the stakeholders contributes' *times* 'quality of the stakeholders' contribution'.

Assessment of involvement of stakeholders can correspondingly be seen as consisting of two elements:

- The assessed importance of the fact that a stakeholder contributes;
- The assessed quality of the contribution, including the contribution to the process (e.g. cooperativeness, and readiness to share information).

It is of course possible that both elements are interrelated. To take an extreme example: if a stakeholder thinks that it is completely unimportant that another stakeholder contributes anything, then it will be unlikely that he will highly value its contribution. But we think that in a lot of cases stakeholders can, and will in practice, distinguish the importance of the fact that another stakeholder contributes and the quality of his contribution.

It should be clear that this kind of assessment is not an exam. Rather, it acknowledges the fact that in a complex multi-actor system there is a plurality of legitimate perspectives. However, it is important that the different actors know each other's perspectives. Transparency in the process is important. Assessment can act as an aid to dialogue and decision-making. (See ref. 17).

3. Users

We see the following groups of users:

- The stakeholders themselves – the most important users. The assessment confronts them with the opinion of other stakeholders about their own role and the quality of their contribution. It should raise questions with themselves, and lead to putting questions to others. Precondition for this is feedback of the results to the stakeholders.
- The coordinators of the process. It can help them to decide where more effort in facilitating discussions, helping clarifying roles, and improving quality, is the most urgent.
- The sponsors of the process. They can see how far involvement of different stakeholders is progressing, and also in which way the coordinators of the process act with respect to this issue.

4. Procedure

The assessment is done in the following way:

I. Distinguish the different (groups of) stakeholders, e.g.

1. Ministry 1
2. Ministry 2
3. Local authorities
4. ICPDR
5. Experts
6. Farmer organizations
7. Environmental NGO's.

II. Ask the stakeholders to answer the following questions:

- Rate the importance you attach **in principle** to the fact that your own organization and the other stakeholders contribute to the process, on a scale from 1-5. (1 = not important at all, 2 = fairly unimportant, 3 = relatively important, 4 = fairly important 5 = very important).
- Rate the quality of the contribution, **given the importance you attach to the fact that they contribute,** on a scale of 0-5 (0 = contribution is unknown, 1 = poor, 2 = fairly poor, 3 = reasonable, 4= fairly good, 5 = good).

  For example, if you think that the fact that a stakeholder contributes is in principle fairly unimportant (you scored here a 2), but that the quality of the (small) contribution was good, then you score here a 5.

  Contribution includes contribution to the process (e.g. cooperativeness, and readiness to share information).

The procedure as presented presupposes that all stakeholders should be informed about the contributions of all other stakeholders. If this is clearly not the case (e.g. the work of experts should be

only known by ICPDR and Ministry 1), then the procedure should be adapted. The design of the assessment should in principle follow the design of the process.

On the other hand, one should be careful not to preclude the possibility of obtaining information from the assessment that could lead to redesign of the process. If for instance Ministry 2 rates Environmental Organizations as *fairly important (4)* but rates the quality as 0 (because in the process it was not foreseen that it would see the contribution of Environmental Organizations), then redesign of the process seems to be called for.

5. Results

The scoring results in three tables:

1. A table for assessment of importance
2. A table for assessment of quality
3. A table with the final scores of involvement

The scoring by an organization is row wise, and the results per organization can be read column wise. If there is more than one stakeholder in a group, the scoring in a cell is the average of the individual scores. For instance, in table 1, two experts scored. In cell [5,1], the scoring of the experts of the importance of Ministry 1, one expert scored 4, the other 5, so the final score is 4,5.

5.1 Importance

Table 1:Assessment of importance of stakeholders by stakeholders

Nr.		1	2	3	4	5	6	7
		Ministry 1	Ministry 2	Local Auth	ICPDR	Experts	Farmer Org.	Envir. Org.
1	Ministry 1	5	3	1	4	1	2	1
2	Ministry 2	4	4	2	3	1	5	4
3	Local Authorities	5	3.3	3	4	2	4	1
4	ICPDR	5	4	3	2	1	5	1
5	Experts	4.5	4	1	5	5	5	1
6	Farmer Organizations	5	4	2	3	1	5	3
7	Environmental Org.	5	2	2	1	1	5	4
	Average	4.8	3.5	2.0	3.1	1.7	4.4	2.1
	Overall average	3.1						

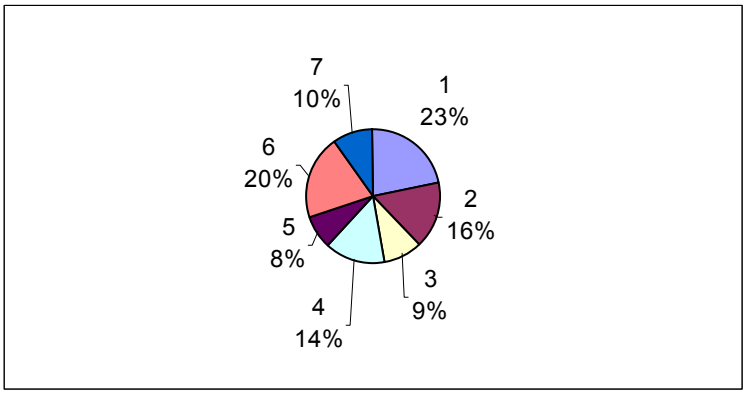
Legenda: The cells are colored according to the following scheme:

Good	3.5-5.0
Reasonable	2.5-3.5
Poor	1.0-2.5

The table can be used in the following ways:

- The average score per stakeholder gives a quick indication of the importance of a stakeholder, as assessed by the complete set of stakeholders.
- From the average score per stakeholder, or group of stakeholders, we can also derive the relative importance (see figure 1). In this case it is clear that Ministry 1 (nr 1), Ministry 2 (nr 2) and the farmer organizations (nr 6) are seen by the complete group of stakeholders as the most important. Together they account for nearly 60% of the score.

Figure 1: Relative importance stakeholders



Legenda: numbers refer to numbers in row 1 of table 1

- If the scores vary widely column wise, it is probable that there is some unclearness about the role of the concerned stakeholder.
- If the self-score differs significantly from the average score, there is a problem. In this example the experts attach a maximum of 5 to their own importance, against an average score of 1,7 (including the self score). What exactly the problem is, is of course not immediately clear. It could be that the experts don't know that their expertise is also present with the other stakeholders, or it could be that the other stakeholders don't know what the experts have to offer, or … Again: an assessment is not a exam, but should help the dialogue between stakeholders.
- Included is also an overall average score. In can help to interpret the average scores per stakeholder.
- In the ideal situation, where the role of every stakeholder is completely clear, we can expect maximal scores in every cell, and a maximal overall overage of 5. The actual overall average indicates how far we are from this ideal situation.
- A comparison can be made between the results for different countries. This could act as a starting point for learning from each other. If farmer organizations score very high in country A, and very low in country B, it seems likely that there is something to learn from the experiences in country A.
- If the process is a multiyear process, comparisons can be made between the results in the different years.

5.2 Quality

The scorings on the quality of the inputs of the stakeholders result in a table like table 2.

Table 2: Assessment quality inputs stakeholders by stakeholders

Nr.		1	2	3	4	5	6	7
		Ministry 1	Ministry 2	Local Auth	ICPDR	Experts	Farmer Org.	Envir. Org.
1	Ministry 1	4	5	3	3	3	1	0
2	Ministry 2	2	4	5	2	4	3	0
3	Local Authorities	3	3.3	3	1.5	1	4	1
4	ICPDR	4	3	3	1	3	3	2
5	Experts	4.5	2	4	2	5	2	0
6	Farmer Organizations	3	3	3	2	2	3	0
7	Environmental Org.	2	1	2	1	1	2	3
	Average	3.2	3.0	3.3	1.8	2.7	2.6	0.9
	Overall average	2.5						

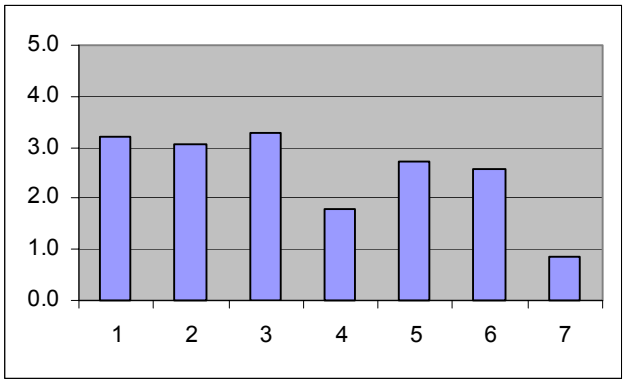
Legenda: The cells are colored according to the following scheme:

Good	3.5-5.0
Reasonable	2.5-3.5
Poor	1.0-2.5

The suggestions for interpretation made under table 1 apply *mutatis mutandis* also here.

Special attention should be given to 0-scores. A 0-score can indicate that communication is serious lacking. It can also be the consequence of the fact that the design has not followed the design of the process. If it were planned for example that Environmental Organizations wouldn't communicate with the Ministries, than it would seem unjustified to include the 0-scores. On the other hand, given the fact that Ministry 2 qualified Environmental Organizations as *fairly important* (4), redesign of the process seems called for. A figure, like the histogram in figure 2, where the average results per stakeholder are shown, can facilitate interpretation of the results.

Figure 2: Assessed quality of inputs



Legenda: numbers refer to numbers in row 1 of table 2

5.3 Involvement

We have defined involvement as 'importance that the stakeholders contributes' *times* 'quality of the stakeholders' contribution'. In table 3 the results for involvement are shown. The entries in the cells are the geometric mean of the entries in the corresponding cells in tables 1 and 2. A score of 1 in table 1 and 5 in table 2 give as the geometric mean the square root of (1*5), equals 2.2. The means are are on the same scale of 1-5.

Table 3: Assessment involvement stakeholders by stakeholders

Nr.		1	2	3	4	5	6	7
		Ministry 1	Ministry 2	Local Auth	ICPDR	Experts	Farmer Org.	Envir. Org.
1	Ministry 1	4.5	3.9	1.7	3.5	1.7	1.4	0.0
2	Ministry 2	2.8	4.0	3.2	2.4	2.0	3.9	0.0
3	Local Authorities	3.9	3.3	3.0	2.4	1.4	4.0	1.0
4	ICPDR	4.5	3.5	3.0	1.4	1.7	3.9	1.4
5	Experts	4.5	2.8	2.0	3.2	5.0	3.2	0.0
6	Farmer Organizations	3.9	3.5	2.4	2.4	1.4	3.9	0.0
7	Environmental Org.	3.2	1.4	2.0	1.0	1.0	3.2	3.5
	Average	3.9	3.2	2.5	2.3	2.0	3.3	0.8
	Overall average	2.6						

Legenda: The cells are colored according to the following scheme:

Good	3.5-5.0
Reasonable	2.5-3.5
Poor	0.0-2.5

Note that taking the geometric mean penalizes heavily lack of communication, resulting in absence of knowledge of the contribution of a stakeholder. In this example, the Environmental Organizations scored an average of 2.1 on *Importance*, and an average of 0.9 on *Quality*, but get an average of 0.8 on *Involvement*.

The reason is that not the geometric mean of the averages results in the end score, but the average of the geometric means of the original scores. For example: the score of 4 for *Importance* from Ministry 2, multiplied with the 0-score for *Quality*, results in a 0-score for *Involvement*. In this way the score of 4 for *Importance* doesn't carry weight any more in the score for *Involvement*

In itself this penalization of lack of communication seems to be correct: high quality products that are not communicated don't contribute in the end. But 0-scores should be carefully analyzed, to see if the cause of the score lies elsewhere. We refer to the remarks made in paragraphs 4 and 5.3.

The use of table 3 will be different from that of tables 1 and 2. These tables should be of interest for all stakeholders, whereas table 3, and more specific the row with the averages, will be informative in the first place for the coordinators of the process. This will be especially the case if the averages for involvement are looked at in conjunction with the averages for importance and quality (see table 4).

Table 4: Overview assessment importance, quality and involvement stakeholders by stakeholders

	Ministry 1	Ministry 2	Local Auth	ICPDR	Experts	Farmer Org.	Envir. Org.
Average importance	4.8	3.5	2.0	3.1	1.7	4.4	2.1
Average quality	3.2	3.0	3.3	1.8	2.7	2.6	0.9
Average involvement	3.9	3.2	2.5	2.3	2.0	3.3	0.8

Legenda: The cells are colored according to the following scheme:

Good	3.5-5.0
Reasonable	2.5-3.5
Poor	0.0-2.5

What policy decisions the coordinators should take is of course not immediately clear. Should efforts be concentrated on improving quality of the most important players, as this will have the biggest impact on the overall result? Or are the involvement scores of these players, as they are by far the highest, satisfactory, and should efforts be concentrated on the weakest performers? Is it likely that stimulation of dialogue and clarification of roles will be an easy way to improve bad results for importance? Or is it likely that help of experts can improve the scores for quality easily? Or should first of all the experts be trained to fulfill their tasks in a different way?

Measuring doesn't tell what the right measures to take are – but it surely can help.

6. Conclusion

The example elaborated here is not more than that: an example. Probably it will be necessary to adopt it from case to case.

It should be kept simple, and oriented towards its goal: to support dialogue and decision-making. Complex political processes, with a lot of actors, have a reflective character. The opinions of actors about each other role and contribution, and about what they think others think about them, influence the process. Clarifying those opinions will stimulate progress.

Complete agreement cannot always be expected. Sometimes the best possible result, as in all political processes, will be the agreement to disagree.

Annex VIII: Methodology for the assessment of policy implementation

Indicators for

Introduction of Best Agricultural Practices

and

Implementation of the EC Nitrate Directive

1. Introduction

The introduction of Best Agricultural Practices (BAP) in vulnerable areas serves to reduce the nutrient loads (pressure) from the agricultural sector. In the terminology of GEF, this is stress reduction. In the WFD terminology, it is Response. Reduction of pressure should lead to a better State, and ultimately to reduce negative Impact, and to restore the ecosystem.

In this chapter we propose a series of indicators, which could serve both (GEF and WFD) purposes.

At the same time, the indicators can be used to monitor the implementation of the Nitrate Directive of the EC. In this way, the proposal can also serve as an example for developing series of indicators to monitor the implementation of other directives.

2. The Nitrate Directive

The Nitrate Directive of the EC stipulates that all Member States should implement good agricultural practices. Annexes II and III of the directive describe what good agricultural practices are. Further on, we will equate BAP with these practices.

The directive contains a number of obligations. We will use these as a guideline for developing indicators for monitoring the introduction of BAP.

3. The framework for the indicators

Following the spirit of the Directive, we distinguish the following steps for the introduction of BAP:

1. Designation as vulnerable zones of all known areas, which drain into the waters vulnerable to pollution.
2. The development of proposals for BAP;
3. The setting up of a programme promoting the application of these code(s), including the provision of training and information for farmers;
4. The development of action programmes for vulnerable zones;
5. The implementation of the action programmes;
6. The drawing up of monitoring programmes;
7. The implementation of monitoring programmes
8. The bringing into force of the necessary laws, regulations and administrative provisions.

The Directive doesn’t in some cases distinguish between drawing up plans and implementing them. Given the situation in a lot of the countries of the DRP en BSERP, we think the distinction useful.

4. Methodology

Depending on the character of the step, we propose for each step of the process of introduction of BAP one or more indicators, which cover the following dimensions:

- Quantity, e.g. percentage of zones for which proposals for an action programme is developed;
- Quality, in most cases the measure into which the requirements of Annexes II and III of the Nitrate Directive are met;
- Involvement of stakeholders.

It is possible to aggregate these into one. The simplest way to do this is to use the same scale, for example a scale of 0-5. Some indicators can be scored directly on this scale; others should be reconverted.

Most scores can be obtained with a quick scan. Moreover, the majority of the indicators follow the same pattern.

Quantity

In most cases this indicator speaks for itself. If the indicator is a percentage, dividing by 20 gives the score on a scale of 0-5 (for example, 50% gives a score of 2.5).

Quality

The EEA has developed a system for assessing the performance of the implementation of measures required by the Nitrate Directive (see Annex 7). Scores are given for 12 different aspects in action programmes, e.g. *Period of prohibition of fertilizer application, Restrictions for application on sloped soils*, etc. Each aspect is scored on a 5-point scale, ranging from 0 (no measure) to 2 (fully satisfactory measure).

We propose a slightly simplified form to assess the quality of proposals, implementation etc. in the form of a 3 point scale, ranging from 0 to 5:

0 = *absent*;

2,5 = *in development* or *partly satisfactory*, depending on the context;

5 = *developed* or *fully satisfactory*, depending on the context;

We will refer henceforth to this method as ***Adapted EEA method***

Involvement

Involvement refers to the extent that a stakeholder delivers his *necessary contribution*. It is the product of two elements: the extent of necessity, or importance, of the fact that the stakeholder should contribute, and the quality of the contribution.

Stakeholders, by rating, assess the involvement of stakeholder:

- The assessed importance of the fact that a stakeholder contributes; scoring is on a scale of 1-5 (1 = not important at all, 5 = very important).
- The assessed quality of the contribution, including the contribution to the process (e.g. cooperativeness, and readiness to share information); scoring is on a scale of 0-5 (0 = contribution unknown, 1 = poor, 5 = good).

For more detailed information we refer to Annex QX, where an example is elaborated.

We will henceforth refer to this method as ***Assessment by stakeholders***

Results

When the scores are known, we end up for each indicator with a box like the following:

			Previous Score	Score	Progress
Indicator X:	Development of proposals for BAP		3.0	4.0	33%
quantity	: -				
quality	: adapted EEA method	2	.5	3,5	40%
involvement	: assessment by stakeholders	3.5	4,5		29%

There is not a quantity dimension in this indicator, so no score on this dimension. The end score for the indicator is (3,5+4,5)/2 = 4.0.

We have added, merely as a suggestion, a score for *Progress*. It is calculated here as the percentage extra on basis of the previous score. It could be useful to keep track of this. It could also be a more or less pedagogical instrument to bolster the self-confidence of slow starters: "we started slow, but we progress fast!". An assessment isn't an exam, but nevertheless it is nice to finish first sometimes!

For suggestions on the presentation we refer to other parts of this report. We suggest that it could be useful to present also the scorings for progress

5. The indicators

In this paragraph the indicators are presented. The scoring is always on a scale of 0-5. When *Area as percentage*, *Adapted EEA method* or *Assessment by stakeholders* are mentioned, the remarks made under the headings *Quantity, Quality* and *Involvement* in paragraph 4 apply.

1. Designation of vulnerable zones

The indicator here is area of actual designated vulnerable zones as a percentage of the potential areas that could qualify. The percentage can grow, as more zones are designated, or as more potential areas turn, closer looked at, out not to qualify.

Indicator 1:	**Designation of vulnerable zones**
quantity	: area designated as percentage of potential area
quality	: -
involvement	: -

2. Proposals for BAP

The development of Establishment of a code for BAP, or the development of proposals for BAP (output DRP 1.2) has the dimension *quality* and *involvement*.

The proposals should cover the items mentioned in Annex 2 of the Nitrate Directive (see Annex 7).

The proposals should be developed in an interactive process, where all the stakeholders are involved.

Indicator 2:	**Development of proposals for BAP**
quantity	: -
quality	: adapted EEA method
involvement	: assessment by stakeholders

3. Programme for promotion of BAP

In the DRP output 1.3 foresees in the establishment of 5 pilot sites for BAP, the

application of BAP by 100 farmers, and the dissemination of the results: at least 1000 farmers should be aware of the results. These are quantity indicators. We can add the quality dimension: to which extent are the different items of the code covered in the pilot sites and in the application by the farmers, and to what extent are farmers aware of these different items? In the last case, the adapted EEA method probably should be simplified. And we can add in all three cases the involvement dimension.

Indicator 3:	**Programme for promotion of BAP**	
Subindicator 3.1:	Pilot sites	
	quantity	: number (scale 0-5; 5 = target)
	quality	: adapted EEA method
	involvement	: assessment by stakeholders
Subindicator 3.2:	Number of farmers applicating BAP	
	quantity	: number (scale 0-5; 100 = target)
	quality	: adapted EEA method
	involvement	: assessment by stakeholders
Subindicator 3.1:	Disseminiation	
	quantity	: number (scale 0-5; 1000 = target)
	quality	: adapted EEA method (simplified)
	involvement	: assessment by stakeholders

4. Development of action programmes for BAP

With the establishment of action programmes three questions seem to be important:

- For which part of the designated vulnerable zones action plans are established?
- To which extent do the plans cover all the elements of BAP?
- To which extent are the stakeholders involved in the development?

Indicator 4:	**Development of action programmes for BAP**
quantity	: area with programmes in development as % of designated areas
quality	: adapted EEA method
involvement	: assessment by stakeholders

5. Implementation of BAP

With the implementation of BAP four questions are important:

- In which part of the vulnerable zones implementation has started?
- What is the quality of the implementation?
- What is the involvement of the stakeholders?
- In how far have the loads diminished (in % of the loads at the beginning of implementation)?

The last question should be answered by setting up a careful monitoring system.

Indicator 5:	**Implementation of BAP**
quantity	: area with programmes implemented as % of designated areas
quality	: adapted EEA method
	: reduction of loads (scale of 0-5; target to be established)
involvement	: assessment by stakeholders

6. Drawing up monitoring programmes

Again two questions:

- For which part of the vulnerable zones monitoring programmes are established?
- What is the quality of the plans?

The second question has two dimensions. The first is the coverage of the different items, for which the adapted EEA method once again can be used. The second question is to which extent the methods used meet the technical requirements as laid down Annex IV of the Nitrate Directive. This could be done by way of a review by an expert, or by peer review.

If different stakeholders would turn out to be important, assessment by stakeholders is also an option.

Indicator 6:	**Drawing up monitoring programmes**
quantity	: area with programmes in development as % of designated areas
quality	: adapted EEA method
	: technical quality (0-5; review by expert, or peer review)
involvement	: assessment by stakeholders (optional)

7. Implementation of monitoring programmes

Again two questions:

- For which part of the vulnerable zones the implementation of monitoring programmes has started?
- What is the quality of the monitoring?

Assessment by stakeholders is optional, depending on the situation.

Indicator 7:	**Implementation of monitoring programmes**
quantity	: area with implemented programmes as % of designated areas
quality	: adapted EEA method
	: technical requirements (0-5; review by expert or peer review)
involvement	: assessment by stakeholders (optional)

8. Laws, regulations and administrative provisions.

The adapted EEA method can once again be used to rate the state of affairs regarding Laws, regulations and administrative provisions. Measuring stakeholder involvement is important; in this case it seems more suitable not to include the score on this dimension in the end score. Here only the quality of the product counts.

Indicator 8:	**Laws, regulations and administrative provisions**
quantity	: -
quality	: adapted EEA method
involvement	: assessment by stakeholders (not counting in end score)

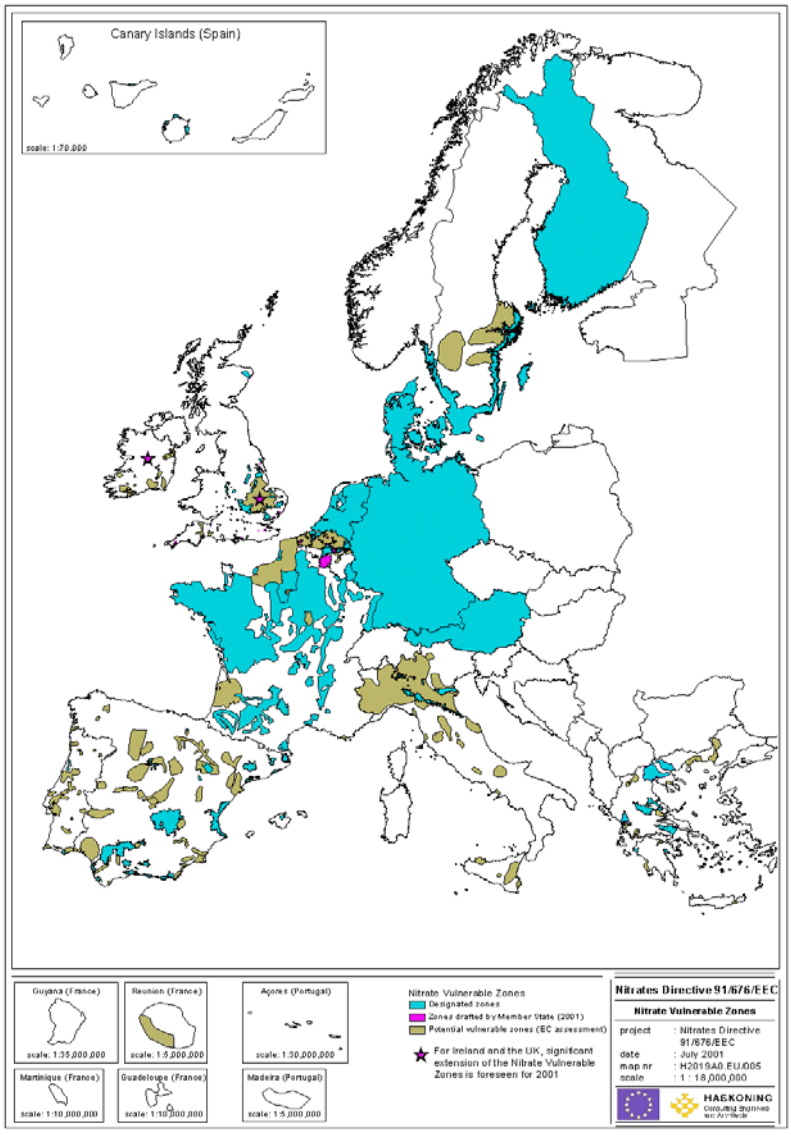
6. Conclusion

In this chapter we have presented a series of indicators to monitor the introduction of BAP and the implementation of the Nitrate Directive. Important characteristics are the distinguishing of the several dimensions of the indicators, and the fact that for the majority the method used is more or less identical. We suggest that these characteristics should be kept intact, when series of indicators for other processes are developed.

Annex IX: Descriptive sheet of EEA Indicator: implementation of the EU Nitrate Directive (AGRI17)

Indicator Fact Sheet Signals 2002 – Chapter Agriculture

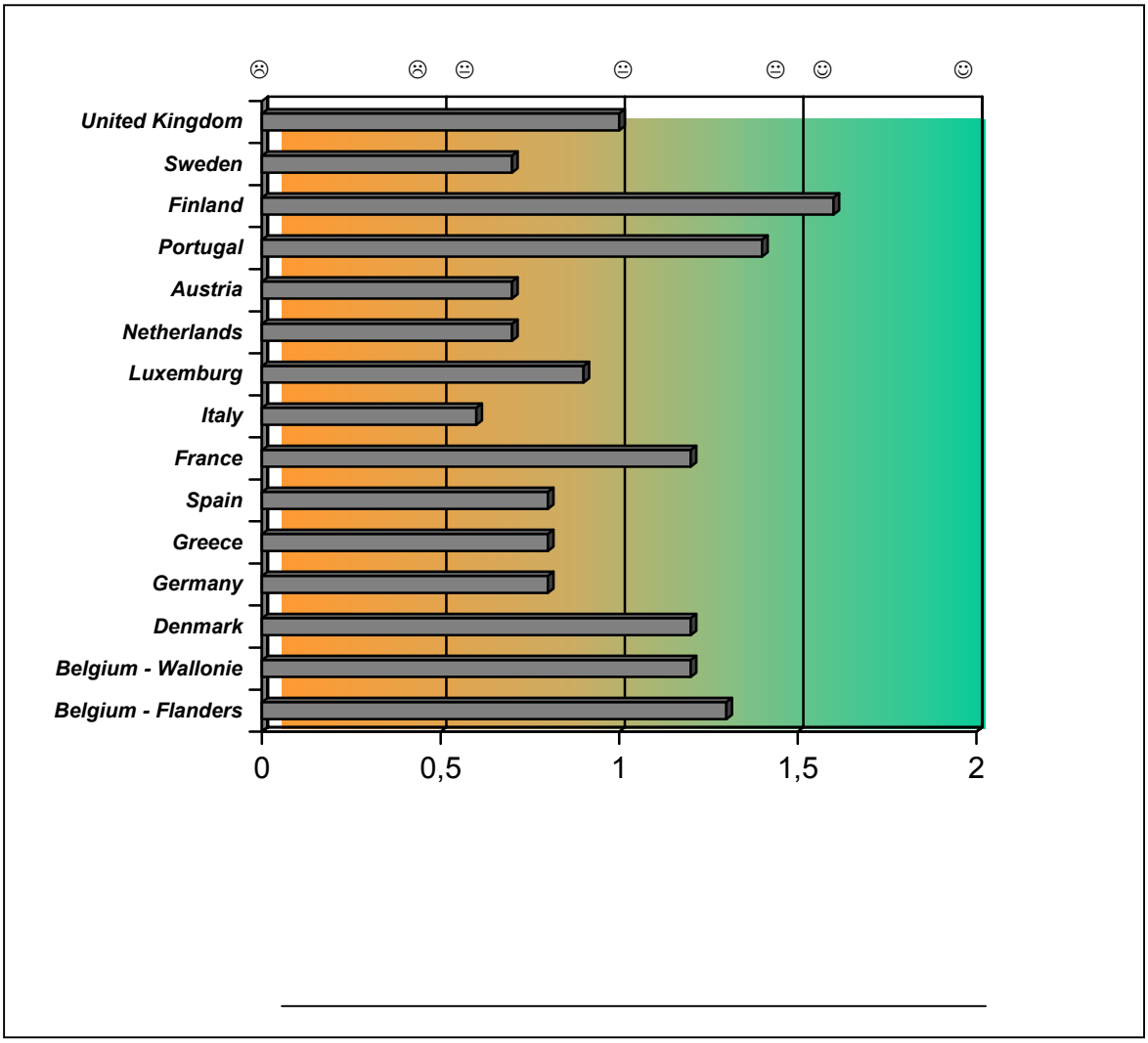
YIR02AG13 - Nitrate Vulnerable Zones and related Action Programmes



Nitrate Vulnerable Zones in the EU

Note: The Commission assessment is based on a (non-exhaustive) review of available information on waters with excessive nitrate concentrations threatened with eutrophication.

☹ The total area of Nitrate Vulnerable Zones (NVZs), as designated by the Member States in June 2001, covers currently 38% (1.2 million km^2) of the EU 15 area. Based on the EC assessment, this area should increase to at least 46% (1.5 million km^2). Designation and revision of nitrate vulnerable zones is still in progress in Ireland, Greece, Belgium and UK.



Adequacy of national Action Plans under the EU Nitrates Directive.

Mean compliance score for 12 aspects of the Action Plans.

0 = unsatisfactory

1 = partly satisfactory

😐 Considerable progress has been made in all Member States in developing action programmes for nitrate vulnerable zones (except Ireland which until 2001 had not designated any NVZ). However, none of the action plans fully comply with the obligations that are specified in the 'Nitrates Directive'. Only five countries reach a mean score higher than 1 (partly satisfactory).

Results and assessment

Policy Relevance

Pollution of surface- and groundwater by excess nutrients from agriculture is a major cause of concern in Europe. In the period 1950-2000 the use of mineral nitrogen increased about tenfold, while total nitrogen in animal manure rose by about 9 million tons. This input far exceeds the uptake by crops and vegetation and poses a threat to surface- and groundwater quality. The nitrogen surplus in 1997 ranged from 24 kg/ ha in Portugal to 256 kg/ha in The Netherlands (Eurostat, 2000). Groundwater aquifers are the source of drinking water for X % of the EU population. Nitrogen input from agricultural sources is also an important contributor to disturbance of aquatic ecosystems, whether inland or marine, by eutrophication, leading to a decline in species diversity, coastal algal blooms, impacts on fish populations etc.

Policy Context

To address the above issue, in 1991 the EU Member States adopted the Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources (The 'Nitrates Directive'). This Directive requires Member States to designate nitrate vulnerable zones and to establish action plans for the minimisation of agricultural nitrate leaching in these zones. These plans should cover aspects of agricultural nutrient management and application that are particularly relevant for nitrate leaching. Annexes II and III of the Nitrates Directive spell out the main types of actions to be taken by the Member States. These include measures such as periods of prohibition of fertiliser application, restrictions for application of manure on sloped or frozen soils, manure storage, crop rotation, buffer strips etc (for a list of 12 key actions see Table 1).

Assessment

The first indicator compares the vulnerable zones as actually designated and drafted by the Member States by June 2001, with the potential areas that would qualify according to a preliminary assessment by the European Commission (J. Duchemin, 2001).

For the second indicator, scores were given for 12 different aspects in the action programmes of each Member State for the first Action Plan period (including actions taken up to 1999/2000; except for Ireland which had no such programme during that period). These scores relate to the Commission assessment (J. Duchemin, 2001) as follows:

Commission assessment:		Score:	
Grim smiley	=	0	(no measure)
Grim + neutral smiley	=	0.5	
Neutral smiley	=	1	(partly satisfactory measure)
Neutral and happy smiley	=	1.5	
Happy smiley	=	2	(fully satisfactory measure)

From the individual scores for each assessed type of action a mean was calculated, yielding an average score between 0 (unsatisfactory) to 2 (fully satisfactory). See Table 1 for a full list of aspects included in this assessment.

Interpretation

Considerable progress has been made in all Member States in developing action programmes for nitrate vulnerable zones during the first action plan period (except Ireland which until 2001 had not designated any NVZ). However, none of the action plans fully comply with the obligations that are specified in the 'Nitrates Directive'. Only five countries reach a mean score higher than 1 (partly satisfactory). This shows that considerable further action is required to ensure effective protection of surface and ground waters from agricultural nitrate pollution in a clear majority of EU Member States.

It should be stressed, that the country scores reflect the formal compliance with the Nitrate Directive, as defined in the preliminary assessment of the European Commission. This interpretation of obligations is still a matter of discussion with the Member States. Nitrate pollution issues can also be tackled by measures that fall outside the immediate framework of the Nitrates Directive. Examples of such approaches are the MINAS programme and the buy-out programme for reducing pig production capacity in The Netherlands, or the extensive agri-environment measures under Regulation 1257/1999 in Sweden. While such additional measures are not necessarily sufficient to achieve a satisfactory protection of surface and ground waters from agricultural nitrate pollution, they can also contribute significantly towards achieving the ultimate objective of the Nitrates Directive.

In general, there appears to be a growing awareness of the urgency to prevent water pollution by the introduction of more environmentally friendly farming practices and systems**.** A close interaction between research activities, government actions, agricultural policy measures and farmers is needed for successful implementation of instruments to reduce nitrogen inputs in agriculture, improve agricultural manure management thus decrease the resulting nitrate leaching.

Meta data

Technical information

Data source: J. Duchemin, 2001. Implementation of elements of the Nitrates Directive. European Commission, DG Environment.

European Commission - DG Environment (2001): Assessment of Action Programmes Established by Member States. Report by Environmental Resources Management (ERM) to DG Environment

Description of data: Geographical map 1:12 500 000, legend units: Designated zones; Zones drafted by Member States; Potential Vulnerable zones (EC assessment).

Table: Qualitative adequacy assessment of 12 Action Plan aspects on a 5-point scale (0 - 0,5 – 1 - 1,5 - 2).

Geographical coverage: EU15

Temporal coverage: status as in June 2001

Methodology and frequency of data collection: Preliminary analysis of the European Commission of Year 2000 Member State reports on the First Action programme (1996-2000) under the Nitrates Directive. The 2nd Action Programme will be evaluated in 2004.

Methodology of data manipulation: No manipulation for map of NVZs. Table on Action programmes: Calculation of mean score for each Member State (value 0-2). Bar-graph presentation.

Strength and weakness (at data level): The adequacy scores for the Member State measures under the Nitrates Directive are based on semi-quantitative criteria that are open to interpretation. The draft report of the Commission has not yet been fully discussed with the Member States.

Reliability, accuracy, robustness, uncertainty (at data level): subjective adequacy scores.

Overall scoring (give 1 to 3 points: 1=no major problems, 3=major reservations):

- Relevancy: 1
- Accuracy: 2
- Comparability over time: Map = 1; Table = 2
- Comparability over space: Map = 1; Table = 2
- Further work required (for data level and indicator level): -

Table 1: Implementation of Measures required in Annexes II + III of the Nitrates Directive by the Member States in the first Action Programmes for Nitrate Vulnerable Zones. Scores given on the basis of an assessment carried out by the European Commission.

Measure	B-Flan.	B-Wal.	DK	D	EL	E	F
Period of prohibition of fertiliser application	😐 / 🙂 1.5	😐 / ☹ 0.5	😐 / 🙂 1.5	😐 / ☹ 0.5	😐 1.0	☹ 0.0	😐 / ☹ 0.5
Restrictions for application on sloped soils	😐 / 🙂 1.5	😐 / ☹ 0.5	😐 / ☹ 0.5	😐 / ☹ 0.5	☹ 0.0	☹ 0.0	😐 / 🙂 1.5
Restrictions for application on soaked, frozen or snow-covered soils	☺ 2.0	😐 / ☹ 0.5	😐 / ☹ 0.5	☺ 2.0	😐 / 🙂 1.5	☹ 0.0	😐 / 🙂 1.5
Restrictions for application near water courses (buffer strips)	😐 / 🙂 1.5	☺ 2.0	😐 / ☹ 0.5	😐 / ☹ 0.5	☹ 0.0	😐 / ☹ 0.5	😐 / 🙂 1.5
Effluent storage works	☹ 0.0	☺ 2.0	☹ 0.0	☹ 0.0	☹ 0.0	☹ 0.0	☹ 0.0
Capacity of manure storage	😐 / ☹ 0.5	😐 / 🙂 1.5	☺ 2.0	😐 / ☹ 0.5	☺ 2.0	😐 / 🙂 1.5	😐 / ☹ 0.5
Rational fertilisation (e.g. splitting fertilisation, limitations)	☺ 2.0	😐 / 🙂 1.5	☺ 2.0	☺ 2.0	😐 1.0	😐 / 🙂 1.5	☺ 2.0
Crop rotation, permanent crop maintenance	☹ 0.0	☺ 2.0	☹ 0.0	😐 / ☹ 0.5	☹ 0.0	☹ 0.0	☹ 0.0
Vegetation cover in rainy periods, winter	😐 1.0	☹ 0.0	☺ 2.0	☹ 0.0	☹ 0.0	☹ 0.0	😐 / 🙂 1.5
Fertilisation plans, spreading records	😐 1.0	☹ 0.0	☺ 2.0	😐 / 🙂 1.5	☹ 0.0	☺ 2.0	😐 / 🙂 1.5
Other measures	☺ 2.0	☺ 2.0	😐 / 🙂 1.5	😐 / 🙂 1.5	😐 / 🙂 1.5	☺ 2.0	☺ 2.0
Date for application limits: 210 / 170 kg N/ha.year	☺ 2.0	☺ 2.0	☺ 2.0	😐 / ☹ 0.5	☺ 2.0	☺ 2.0	☺ 2.0
Total points scored	15	14.5	14.5	10	9	9.5	14.5
Average score	1.25	1.2	1.2	0.83	0.75	0.79	1.2

Measure	I	LUX	NL	A	P	FIN	S	UK
Period of prohibition of fertiliser application	☹ 0.0	😐 1.0	😐 1.0	😐 / ☹ 0.5	😐 / ☹ 0.5	☺ 2.0	😐 / ☺ 1.5	😐 1.0
Restrictions for application on sloped soils	😐 1.0	😐 / ☹ 0.5	☹ 0.0	☹ 0.0	☺ 2.0	😐 1.0	☹ 0.0	☹ 0.0
Restrictions for application on soaked, frozen or snow-covered soils	☺ 2.0	😐 1.0	😐 1.0	😐 / ☹ 0.5	😐 / ☺ 1.5	☺ 2.0	😐 / ☺ 1.5	😐 / ☺ 1.5
Restrictions for application near water courses (buffer strips)	😐 1.0	😐 / ☹ 0.5	😐 / ☹ 0.5	😐 / ☹ 0.5	😐 / ☺ 1.5	😐 / ☺ 1.5	☹ 0.0	😐 1.0
Effluent storage works	☹ 0.0	☹ 0.0	☹ 0.0	☹ 0.0	☹ 0.0	☺ 2.0	☹ 0.0	☹ 0.0
Capacity of manure storage	😐 / ☺ 1.5	😐 / ☺ 1.5	😐 / ☹ 0.5	☹ 0.0	☺ 2.0	☺ 2.0	😐 / ☺ 1.5	😐 / ☹ 0.5
Rational fertilisation (e.g. splitting fertilisation, limitations)	☹ 0.0	😐 1.0	😐 1.0	☺ 2.0	😐 1.0	☺ 2.0	😐 1.0	😐 / ☺ 1.5
Crop rotation, permanent crop maintenance	☹ 0.0	☹ 0.0	☹ 0.0	☹ 0.0	☹ 0.0	☹ 0.0	☹ 0.0	☺ 2.0
Vegetation cover in rainy periods, winter	☹ 0.0	😐 / ☹ 0.5	😐 / ☹ 0.5	☹ 0.0	☺ 2.0	😐 1.0	😐 1.0	☺ 2.0
Fertilisation plans, spreading records	☹ 0.0	😐 / ☺ 1.5	☺ 2.0	☺ 2.0	☺ 2.0	☺ 2.0	☹ 0.0	☹ 0.0
Other measures	😐 1.0	😐 / ☺ 1.5	☺ 2.0	😐 1.0	☺ 2.0	☺ 2.0	☺ 2.0	😐 1.0
Date for application limits: 210 kg N/ha.year 170 kg N/ha.year	😐 1.0	☺ 2.0	☹ 0.0	☺ 2.0	☺ 2.0	☺ 2.0	☹ 0.0	😐 / ☺ 1.5
Total points scored	7.5	11	8.5	8.5	16.5	19.5	8.5	12
Average score	0.625	0.92	0.71	0.71	1.375	1.625	0.71	1.0

Updated 2002-05-14