

CapWEM

**Implementation of Laws and Guidelines in
the Water Sector – Handbook of best
practices**

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PREFACE

CapWEM stands for “Capacity Development in Water Engineering and Environmental Management” and was a joint project of universities from eight countries in Latin America and Europe: Argentina, Brazil, Chile, Costa Rica, El Salvador, Paraguay, Portugal and Germany. The University of Siegen in Germany was responsible for the coordination of the project.

CapWEM's main objective was to improve higher education and enhance competences of professionals in the topics of water and environment in the Latin American partner countries. These targets were achieved by fostering academic cooperation between Latin America and Europe and establishing networks, aiming to create opportunities for sustainable collaboration both inside and outside academia.

Latin American countries are facing enormous challenges in terms of ensuring good water quality, equitable access to clean water and protection against water-related hazards like floods and droughts. Universities play a vital role within the process of meeting these challenges by training the future experts according to the state of the art. In addition universities should provide professionals in practice with recent research results and extend their knowledge. In order to achieve socio-economic benefits, the higher education institutions must be open for collaboration with public authorities and private companies. Finally they should contribute to increase public awareness regarding environmental protection and the proper use of water.

CapWEM organized its activities in different working groups covering the topics of improving Higher Education in undergraduate, graduate and doctorate programs; fostering continuing education for professionals; promoting cooperation between higher education institutions and private/public sector by technology transfer, common work on guidelines/norms and increasing environmental awareness; improving risk management, especially in cross-border watersheds.

CapWEM ran over a period of three and a half years from 2011 until 2014. The main outcomes of the project are published in this series. The project has been funded by the EU programme ALFA of the Directorate-General EuropeAid under the contract number DCI-ALA/19.09.01/10/21526/254922/ALFAIII (2010)55. ALFA stands for "América Latina - Formación Académica" and is a programme to support the institutional cooperation between higher education institutions in the European Union and Latin America.

The intensive collaboration among partners and their effective engagement over a period of more than three years fostered comprehensive results and experiences. Seven project meetings took the CapWEM team to all participating universities in order to consider regional adapted problems and solutions. A huge number of students and professionals could benefit from CapWEM's activities. We expect that the project results will have positive impact on socio-economic development and help to face the challenges in the topics of water and environment in Latin America more efficiently.

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Handbook

Implementation of Laws and Guidelines in the Water Sector – Handbook of best practices

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MOTIVATION

In the Latin American countries, legislation (laws) in the environmental and water sector is available or in the implementation process, which is comparable to the European legislation. Various laws are highly inspired by those in Europe. In Latin America, a change in thinking can be seen, water laws are amended or have been recently amended. The same applies to guidelines, norms and standards. These are in continuous process of improvement, because currently the water sector is not completely covered with guidelines, norms and standards. However, in most countries, there is a lack in putting existing laws into practice: „The laws in the water sector are available with a nearly American or European standard. A big gap is in the field of implementation – the system fails in the point good governance and in the point to bring the law in practice“ (Experts in Sector of Law). This is due to the insufficient collaboration between the private sector of economy, environmental and water authorities, ministries, chambers of commerce and the universities on the one hand. On the other hand, it often lacks in the enforcement of restrictive measures (penalties and sanctions) in case of failures to transpose laws, although penalties and sanctions often being given by law. In the practice, in most cases they are not used due to lack of monitoring. In case of installed monitoring systems many river basins do not have a clear structure of the monitoring network along the water body available. This hampers not only to assess the water quality of the entire river basin but also to localise a polluter, as well. There is no clear structure of responsibilities, and there is a lack of self-management of the private sector of the economy in terms of environmental protection. This became ever more apparent during the conduction of expert seminars in Latin America on different topics of the water and environmental sector.

Another important issue is the environmental education. Basically, it is important to anchor the concept of sustainability (environmental protection) in all levels of the education system (kindergarten, schools, universities, vocational education and training). If one is sensitive with respect to the environment (environmental behaviour), compliance with and implementation of laws is easier since a basic understanding of the population has been achieved. Compared to Europe, strategies such as benchmarking, neighbourhoods in the different fields of water management and cross compliance are not yet common practice in Latin America. However, it would be worth considering whether such strategies are useful in an adjusted form in Latin America to support the enforcement of laws. They help to increase the transparency and motivation, support the knowledge exchange and networking, and establish some kind of competition in terms of establishing good practice.

Therefore, the question arose which methods might help to implement those laws in the water and environmental sector into practice and how the universities could contribute to this by qualification of students, offering further training activities for engineers or by research.

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1. Introduction

The background to the issue of laws and their implementation into practice is evident while considering problems in the sector of water and environment in Latin America. For the implementation of Laws a clear regulatory structure of responsibilities and a strict and mandatory time schedule concerning the implementation is of great importance. In the case of the EU Water Framework Directive for instance, there are CIS (Common Implementation Strategy) guidance documents available which help to implement the complex directive. Norms, standards and guidelines contribute to the implementation of laws in the water and environment sector. They support the self-management of the private sector of the economy and relieve the state of the responsibility (and therefore the legislations) for developing detailed technical specifications. Also the process of benchmarking or specialist neighbourhoods contributes to the implementation. Cross compliance in the sector of soil protection (land use) is another strategy to implement a law. But the most important point is environmental education as early as possible. By this Handbook methods and strategies will be shown, which contribute directly or indirectly to the implement laws.

2. A clear regulatory structure

The clear structure of implementation of a Water Law and a clear regulatory structure of responsibilities are shown on the example of the EU Water Framework Directive (Directive 2000/60/EC). With coming into force of the directive (22.12.2000), specific deadlines (strict mandatory time schedule) are associated during which the implementation into national law, the inventory, the monitoring programs, the management plans and the programs of measures have to be completed. In the case of non-compliance the Member States are sanctioned with financial penalties. After finishing each working step, a report has to be submitted to the EU commission (EC). For these procedure the EC has introduced a so-called “reporting system”, the “Water Information System Europe (WISE)”. In the Water Framework Directive (WFD) it is determined that the objective to reach a good status for all waters has to be achieved by the year 2015 (at the very latest by the year 2027, only in specific cases). On overview of the defined list of concrete tasks, specified objectives and completion deadlines is given in table 1. For the first time Europe-wide management plans are drawn up for waters. For this purpose the communication between actors at the regional level like for instance water management, many direct and indirect water users, measure carriers, interest groups, the population in the river basins, such as the Rhine, Weser, and Ems, as well as between federal and state governments in Germany and the partners in Europe is necessary.

The essential objective of the WFD is to achieve and to maintain a good ecological and chemical status of surface waters as well as a good quantitative and chemical status for the groundwater. The aim for artificial waters and heavily modified waters is to achieve a good ecological potential. The management of surface and groundwater which corresponds to WFD's objectives requires comprehensive information about water management-related basic data, which depict the actual status of the water bodies like course of waters, riverbed, bank structure, and passability of the water bodies. This includes knowledge about pollution causes, existing water uses and the possibilities to improve the water status taking into account the existing use. The current deficits of waters provide the basis of assessment.

Table 1: WFD's time schedule

Date	Activity
2000	Directive entered into force
2003	Transposition of the Water Framework Directive into national legislation.
	Identification of the river basin districts (RBD) and determination of the competent authority.
	Characterisation of river basin: pressures, impacts and economic analysis
	Completion of analyses of the RBD characteristics and human activity impacts on status of
2004	surface waters and groundwater.
	Completion of the first water use analysis.
	Establishment of the Register of Protected Areas.
	Implementation of the water monitoring programmes (networks).
2006	Make available for comments to the public the subject and time schedule of processing of
	the river basin management plans.
2007	Make available for comments to the public, the preliminary draft of the significant water
	management issues pursuant to WFD.
2008	Make available for comments to the public, the drafts of the river basin management plans.
2009	Adoption and publication of the first river basin management plans and their programmes of
	measures.
2010	Introduce price policy. Water services should be cost-covering. Environmental and resource
	costs have to be taken into consideration.
	Assurance of the controlled discharge of waste waters under the combined approach to the
2012	point and diffuse pollution sources. Make operational programmes of measures.
	Implementation of the measures.
	Achievement of environmental objectives determined in the first river basin management
	plans: achievement of required status improvement of waters (i.e. "good status"). First
2015	management cycle ends
	Adoption and publication of the second river basin management plans with revised
	programmes of measures & first flood risk management plan.
	Achievement of environmental objectives determined in the second river basin management
2021	plans. Second management cycle ends.
	Adoption and publication of the third river basin management plans.
2027	Achievement of environmental objectives determined in the third river basin management
	plans. Third management cycle ends, final deadline for meeting objectives of the WFD

The most important work in the first implementation phase was the inventory or the content of the inventory, since all other steps were based on it. The content determined by the WFD:

- General description of surface waters and groundwater;
- Delimitation of water bodies; determination of reference status for surface waters;
- Analysis of the chemical, biological and structural status of waters;
- Analysis of the quantitative status of the groundwater; analysis of the pollution influence on waters;
- Description and review of the impacts which signify pressures for the waters;
- Preliminary designation of artificial and heavily modified water bodies;
- Economic analysis of water utilization;
- Register of protection areas and first economic analysis for cost recovery verification of water supply services.

For executing this work a monitoring system is required and a clear structure of responsibilities. The rivers were divided in a spatial structure: river basin districts, sub catchment areas, planning units, water bodies. An example is given based on the river Rhine (figure 1).

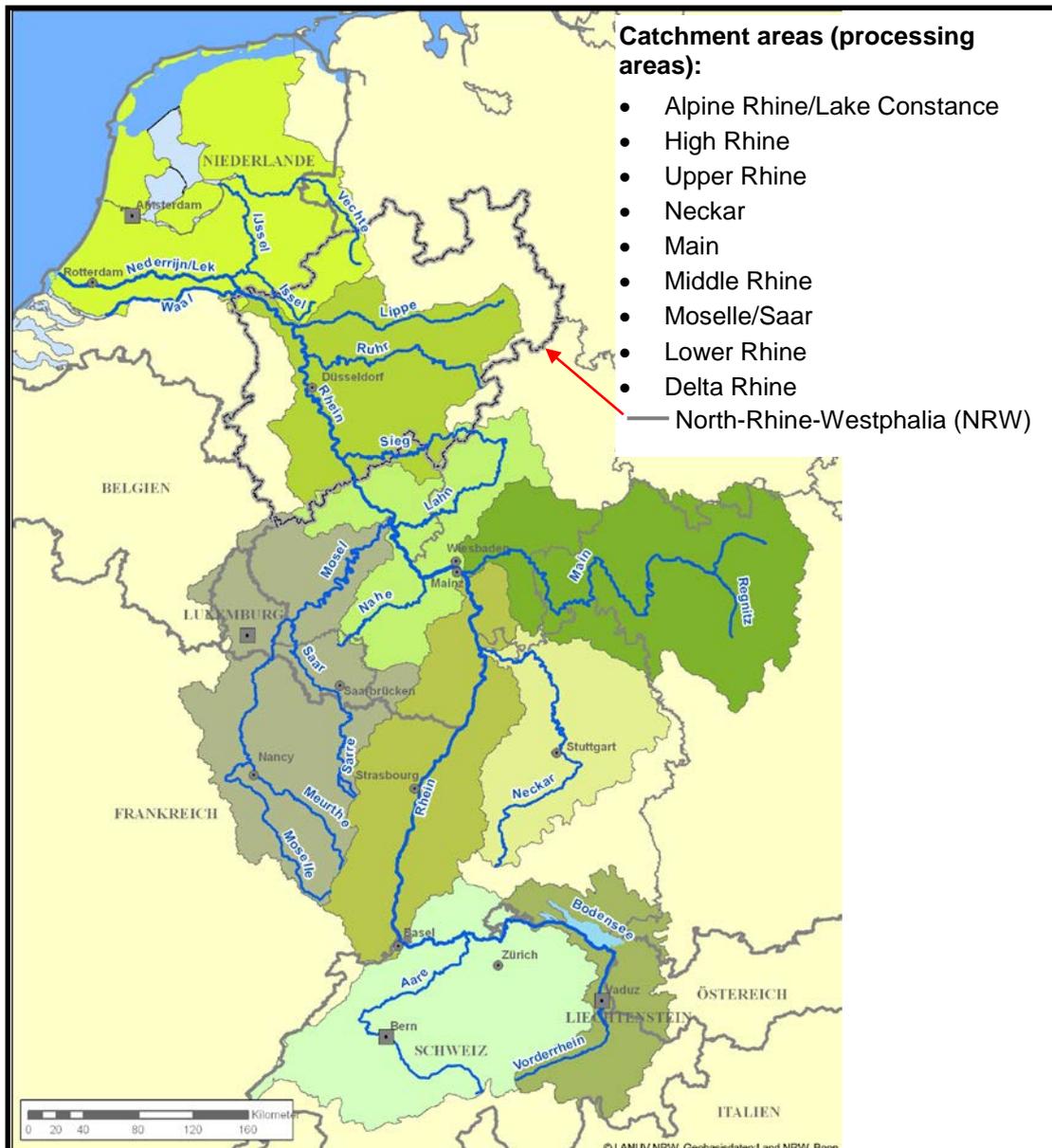


Figure 1: River basin district Rhine with the catchment areas (working areas); Ministry of Environment, Nature Conservation, Agriculture and Consumer Protection, NRW

In order to be able to coordinate the works and synchronization for WFD's implementation in the large river basin districts, transnational coordination offices were established. These coordination offices or coordination groups are, for example, the International Commission for the Protection of the Rhine (ICPR) and the German commission for the protection of the Rhine (DK-Rhein) or the river basin community Weser (FGG-Weser). From the German side, these groups include the Federation as well as the federal states which are located in the river basin. Due to the size and the complexity of these river basin districts, they are spatially divided into practicable catchment areas (working areas) and further subdivided into sub-catchment areas and planning units. This were done in due consideration of hydrographic

and natural environment conditions. The sub-catchment areas serves for the integration of local knowledge into the management planning; the people can identify with the sub-catchment areas since they connect them with their habitats. An example on NRW is given in figure 2.

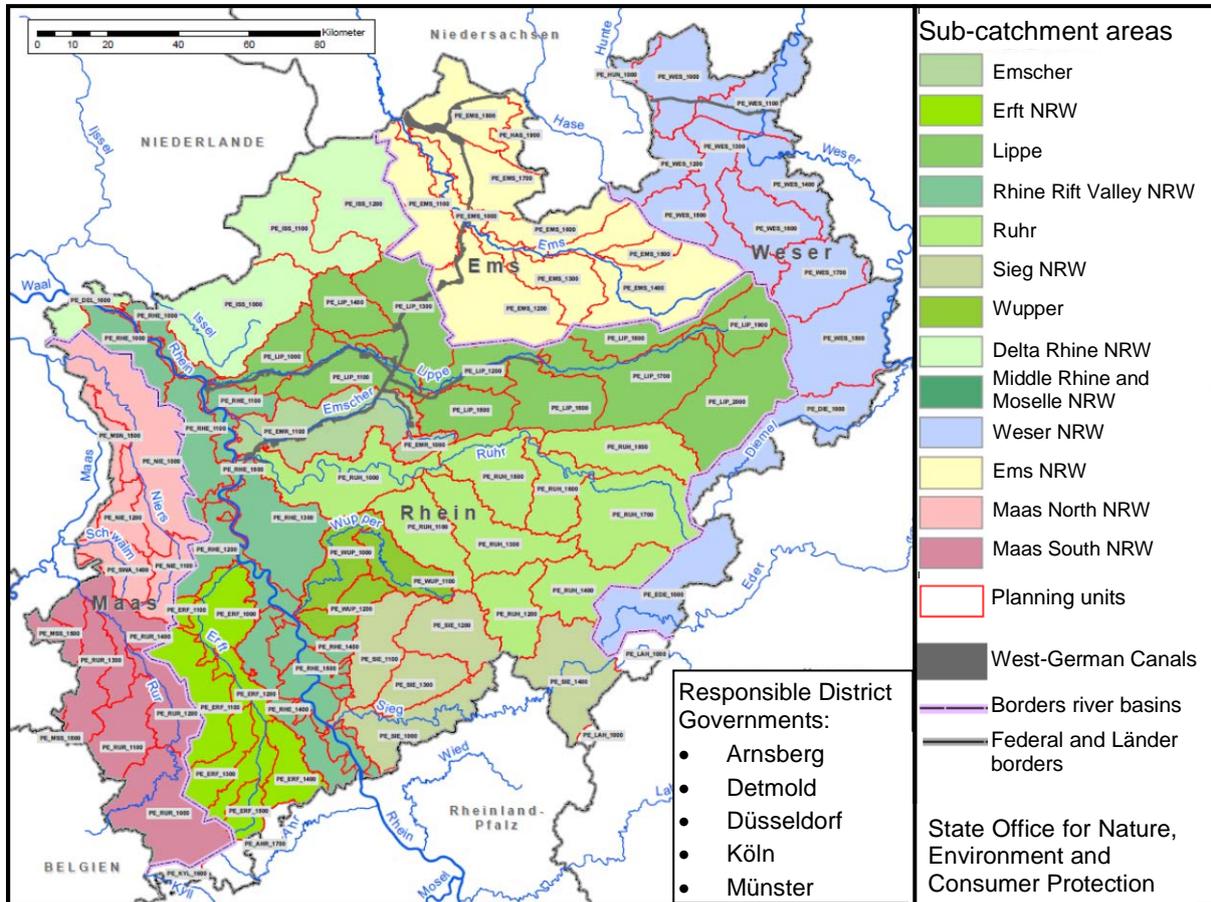
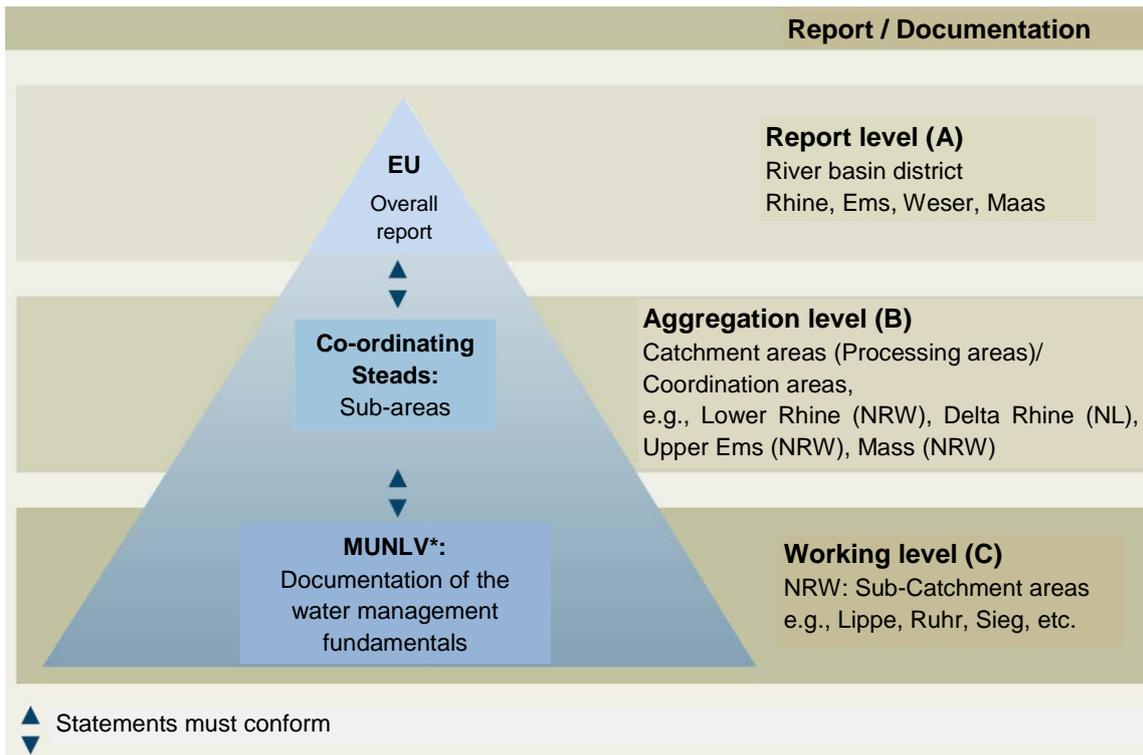


Figure 2: Sub-catchment areas and planning units in NRW; Ministry of Environment, Nature Conservation, Agriculture and Consumer Protection, NRW

The implementation process of the WFD is regionally accompanied by regular meetings of the working groups at the sub-basin level. For the purpose of investigation and processing regarding a management planning, sub-catchment areas are relatively large since an active participation of the local authorities (municipality, cities, and rural districts) must be achieved. Thus, a further subdivision was made in planning units, according to hydrographic criteria. Planning units are larger units consisting of water bodies (the smallest unit) and coherent regions. They are comparatively homogeneous with reference to pollutions and respective measures. Moreover, ecosystem have to be taken into consideration as well. For the planning unit so-called planning unit profiles with the most important information were created. The administrative structure from the EU down to NRW is given in figure 3 and the detailed administrative levels in NRW are given in figure 4 and figure 5. A central claim of the WFD is public information, consultation and participation. One important instrument of public participation is the transparent information of the population, stakeholders and the municipal decision makers in order to create awareness for the importance of management objectives and to achieve an early acceptance for the program of measures.



*Ministry of Environment, Nature Conservation, Agriculture and Consumer Protection, NRW

Figure 3: Administrative structure from the EU down to NRW;

http://daten.flussgebiete.nrw.de/bestandsaufn/daten/niederrhein/abb/abbe_2.pdf

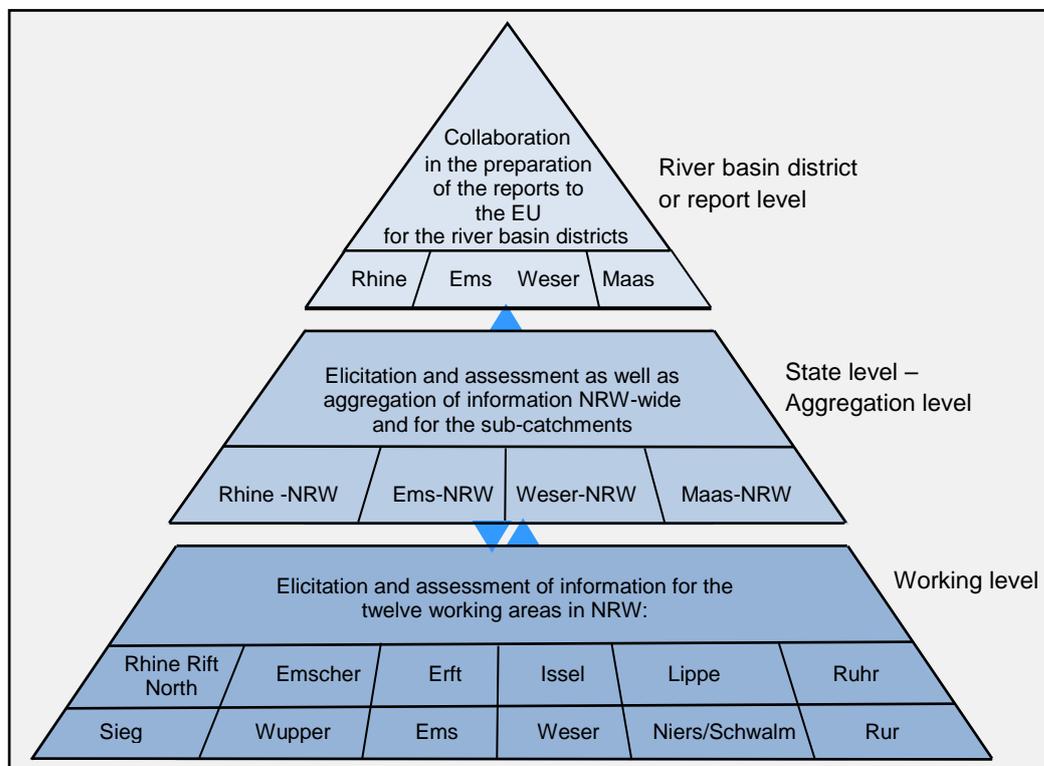


Figure 4: Administrative structure in NRW; Ministry of Environment, Nature Conservation, Agriculture and Consumer Protection, NRW

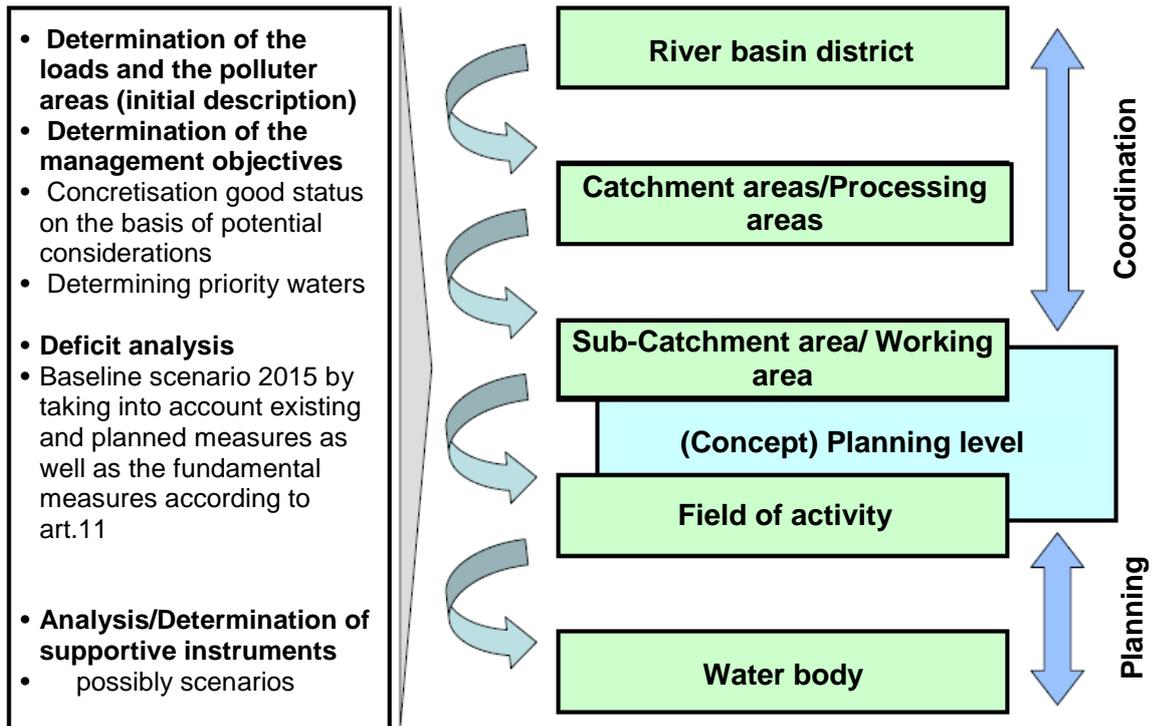


Figure 5: Management of river basins in NRW - Structure

In these structure, surface water bodies are a discrete and significant element of surface water such as a lake, a reservoir, a stream, river or canal, part of a stream, river or canal, a transitional water or a stretch of coastal water. A groundwater body is a distinct volume of groundwater within an aquifer or aquifers. A surface water body shall be selected in a way that its condition can be precisely described and compared with the environmental objectives of the laws.

The monitoring programs are needed in order to evaluate the surface water's and the groundwater's status. This is a demanding task and requires a high degree of expertise. The measuring programs were coordinated in sub-catchment areas. The monitoring of water bodies (surface and groundwater) and the operation of monitoring networks in river basins are regulated by explicit structures and responsibilities as explained before. This ensures that work is never done twice. For the task of monitoring criteria for typecast of water bodies, criteria for the selection of measuring points, investigation and evaluation methods as well as the rules for assessment of the water body's status are specified in monitoring guidelines.

If monitoring of water bodies, for example, is conducted by various institutions and authorities with no clear structure of responsibility, and a data exchange does not take place the risk can occur that the work is done double or triple. A structured development of monitoring networks in the river basins is crucial. If this is not the case, the identification of water polluters is hardly possible. The development of a monitoring network in terms of river basins with clear structures and responsibilities and the development of a database are of great importance, stimulating the exchange of data between the ministries, water authorities, river basin committees and universities. An overview about the WFD's types of monitoring is shown in table 2. Monitoring information requirements should include:

- Classification status of surface water.

- Chemical status of all groundwater bodies or groups of bodies determined to be at risk.
- Reliable assessment of quantitative status of all groundwater bodies or groups of bodies.
- Estimates of the direction and rate of flow in groundwater bodies that cross Member States boundaries. This should be used in the assessment of long term trends, both as a result of changes in natural conditions and through anthropogenic activity.
- Estimates of pollutant loads transferred across international boundaries or discharged into seas.
- Assessments of changes in status of water bodies.
- Causes of water bodies failing to achieve environmental objectives.
- The magnitude and impacts of accidental pollution.
- The inter-calibration exercise.
- Compliance assessments with the standards and objectives of Protected Areas.
- A quantification of reference conditions (where they exist) for surface water bodies.

Monitoring programs and monitoring networks are designed in a way that a multiple use of the data collected for different purposes of investigation and reporting duties synergistic effects are ensured. In Germany the programs are supported by technical information systems of the federal states. In NRW the information system is called ELWAS, which is an electronic water management network system for the administration of water management in NRW. More information about ELWAS is available under: <https://www.umwelt.nrw.de/umwelt/wasser/wasserinfo/index.php>

Table 2: WFD's time schedule, Monitoring Guidance SW Part B, Ministry of Environment, Nature Conservation, Agriculture and Consumer Protection, NRW

The WFD distinguishes between three types of monitoring for surface waters (described in Annex V of the WFD): surveillance, operational and investigative monitoring.	
Surveillance (supra-regional scale)	Trend tracking, assessment of substance loads, alarm monitoring on the Rhine and Ruhr, success control of supra-regional effective measure programs, ensuring the coherence of monitoring in river basins, accomplish of other national and international reporting obligations. Parameters indicative of all the biological, hydro-morphological and general as well as specific physico-chemical quality elements must be monitored. River basin reports; catchment area > 2500 km ² .
Operational (regional scale)	Comprehensive assessment of the status of all water bodies, basis for the determination of management objectives, success control of measure programs. The parameters used should be those indicative of the biological and hydro-morphological quality elements most sensitive to the pressures to which the body is subject, as well as all priority substances and other substances discharged in significant quantities. Water body (groups); catchment area > 10 km ² ; regional level; EU reporting.
Investigative (local scale)	Cause study; this includes, if necessary, the investigation of the influence of smaller waters, concrete measure planning, success control of specific measures, e.g., related to the monitoring of waste water treatment plants, investigations associated with fish kills or other damages (information on accidents) or for further information about surface water bodies. Load-specific biological quality components and specific substances. Catchment areas < 10 km ² ; local level.
In terms of groundwater's chemical status, surveillance and operational monitoring are required. In addition a water level monitoring network is required (quantitative status) of all groundwater bodies.	
These types should be supplemented by monitoring programs required for protected areas, e.g., areas that are protected for drinking water or for natural habitats and species	

3. Guidance Documents for the implementation of the WFD (CIS)

The European Water Framework Directive particularly sets an ambitious timetable for the implementation of the specific objective to reach a good status for all waters by the year 2015. The achievement of objectives includes several working steps which have to be carried out by the member states within the set time limit, as explained above. In addition, many of the European river basins are international, crossing administrative and territorial borders and therefore a common understanding and approach is crucial to the successful and effective implementation of the Directive. To manage this challenge, a corporate strategy (CIS - Common Implementation Strategy) and an organized course of action is needed. Hence, Guidance Documents have been worked out to support the implementation of the WFD in order to enable a conclusive, coherent and harmonious implementation. The non-legally binding and practical Guidance Documents have been developed and adopted at EU level.

- They comprise the necessary concretisation on the WFD and imply that several working groups of the EC incorporated their expertise into the process in order to explain specific implementation steps of the Directive more in detail.
- The Focus is set on methodological questions in terms of a common understanding of the technical and scientific implications of the WFD.
- The Guidance Documents are targeted to those experts who are directly or indirectly implementing the WFD in river basins. Thus, the structure, presentation and terminology is adapted to the needs of the experts. Formal and legalistic language is avoided wherever possible.

With legal validity of the Directive, the CIS process was initiated by the Water Directors of the European Union, Acceding Countries, Candidate Countries and EFTA Countries. Currently 28 CIS Guidance Documents concerning the WFD are available (www.umweltbundesamt.at; European Communities, 2005). Some examples are given in the following:

N° 2 - Identification of Water Bodies,

N° 3 - Analysis of Pressures and Impacts,

N° 4 - Identification and Designation of Heavily Modified and Artificial Water Bodies,

N° 5 - Transitional and Coastal Waters - Typology, Reference Conditions and Classification Systems,

N° 6 - Towards a Guidance on Establishment of the Intercalibration Network and the Process on the Intercalibration Exercise,

N° 7 - Monitoring under the Water Framework Directive,

N° 8 - Public Participation in Relation to the Water Framework Directive,

....

N° 13 - Overall Approach to the Classification of Ecological Status and Ecological Potential,

N° 14 - Guidance on the Intercalibration Process (2004-2006),

.....

N° 19 - Surface water chemical monitoring,

.....

Five Guidance Documents are presently available for groundwater:

- N° 15 - Groundwater Monitoring (WG C),
- N° 16 - Groundwater in Drinking Water Protected Areas,
- N° 17 - Direct and indirect inputs in the light of the 2006/118/EC Directive,
- N° 18 - Groundwater Status and Trend Assessment,
- N° 26 - Risk Assessment and the Use of Conceptual Models for Groundwater.

In addition to the Guidance Documents, seven technical reports have been published. The Guidance Documents and the reports are available in English language under the website: http://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm

The aim of the CIS process is, in addition to the preparation of Guidance Documents, a common exchange of information between the parties concerned. Solutions for a common information and data management are discussed and pilot projects are carried out for the practical testing of the work results. The co-operation at European level takes place on several levels. The highest decision-making council is the Conference of the Water Directors, which is an informal body. The conference consists of the water department heads of the Member States and representatives of the European Commission. The Strategic Co-ordination Group (SCG) prepares the meetings of the Conference of the Water Directors and coordinates the work in the technical working groups. The number and selection of the topics of the Working Groups, Expert Advisory Fora, Strategic Steering Groups and Preparatory Groups, which work out the technical basis within the CIS process, are defined and decided at regular intervals. In the different working groups the Member States (experts from the water authorities of the Federal States) and the EC-Commission are represented (figure 6).

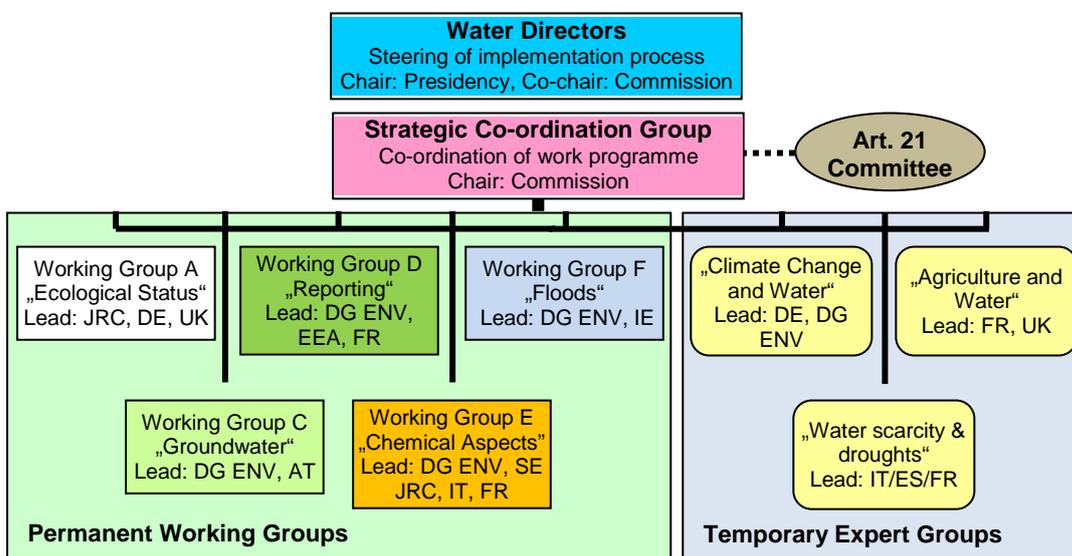


Figure 6: CIS Organisation 2010 – 2012

Source: <http://ec.europa.eu/environment/water/water-framework/implementation.html>

In addition to the CIS Guidance Documents, in Germany “Working Papers” are available that describes the CIS Guidance Documents more in detail. Examples of such Working Papers are:

- the “German guidance document for the implementation of the EC Water Framework Directive”,
- the “Conceptual framework for the establishment of monitoring programs and for the assessment of the status of surface waters”.

Furthermore, guidelines were published in consideration of specific national conditions (specific characteristics in the river basins) through the ministries of the federal states. To give an example in NRW guidelines available:

- on “Inventory of Waters”,
- for the “Monitoring of Surface Waters” and “Groundwater”,

The guidelines for monitoring surface waters are divided into four areas:

- Part A - Implementation of monitoring;
- Part B - Conception of measurement programs;
- Part C - Assessment of water status and
- Part D - Analysis methods, quality specifications, and quality assurance.

The Criteria for the typecast of water bodies, criteria for the selection of measuring points, investigation and evaluation methods as well as rules for the assessment of the water body’s status are specified in the monitoring guidelines section A to section D. The aim of the NRW Guidelines is the systematic and consistent implementation of the WFD on the working and aggregation level.

For the purpose to have working groups on federal level (or as this example on EU-level) it is recommendable to implement a Federal/States Working Group on Water (Soil, Waste, Nature Conservation,...). The aims are:

- to discuss questions arising in the areas of water management and water legislation in detail,
- to formulate solutions and to put forward recommendations for their implementation.
- Topical questions in the national, supranational and international scope can also adopted and discussed on a broad basis, and the findings can submitted to the relevant organizations.

The Federal/States Working Group on Water can be composed of permanent working groups and issue-specific ad hoc committees for instants to deal with different subjects of water legislation, hydrology, inland waters and sea protection, ecology, flood prevention, coastal protection, groundwater, water supply, municipal and industrial sewage and handling with water polluting substances.

The results obtained from this work form a basis for the implementation of a standardised water management system within the federal states with a sufficient space for taking account of specific regional characteristics. In addition, continuous and up-to-date information for the general public through publications based upon the findings of the working groups can be provided.

4. Norms, standards and guidelines in the water and environmental sector

The laws at national and/or state levels as a rule are supplemented by ordinances of the Federal Government and the state governments. And sometimes, for instance in the Federal Water Act pointed with the state of the art towards the Wastewater Ordinance. The Wastewater Ordinance concretizes the Federal Water Act and binds not only authorities and courts but also the citizen. In the case of contravention of the rules for instance in the case of water pollution, the polluter is punishable. At the state level, in addition to ordinances, administrative regulations and technical building regulations are important. They govern detailed issues at the level of federal state laws. The lowest level is the Acknowledged Rules of Technology and the Rules of Technology (norms, standards, guidelines). The principle is shown in figure 7 on an example of Germany.

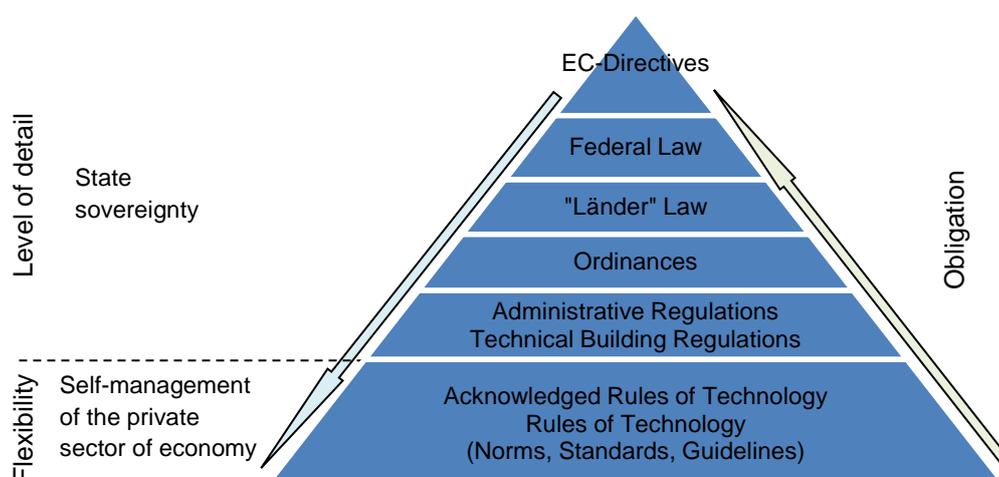


Figure 7: The structure of the implementation of laws in Germany

Uniform norms, standards and guidelines provide an important contribution to the efficient and economic protection of material goods and environment. They serve quality assurance in technology, economy, science and administration. They contribute to the protection of the society as well as safety and understanding. Norms, standards and guidelines work as one common technical language. They can provide a knowledge base for research, development as well as vocational education and training and facilitate the cooperation between economy and research (e.g. in measurement and control techniques). By developing norms, standards and guidelines, professional associations take self-responsibility and self-management for their specific area and relieve the state of the responsibility for developing detailed technical regulations. This means that in the legislation, the lawmaker can react in a more flexible way to relevant changes in technology by reference to the current state of the art (e.g. Norms of the DIN or Guidelines).

Norms, standards and guidelines ought to base on practical and research experience and especially serve the implementation of laws into practice. It is evident that they help to transform results from research and development more quickly and easily into marketable products and proceedings.

4.1. Norms and Standards

Norms are elaborated at national, European and international level, whereby here reference is only made to the national level. In contrast to Latin America, in Germany the preparation is a task of the self-management of the private sector of the economy. Thus, the German Institute for Standardization (DIN) is organized privately (friendly society). Due to a contract with the Federal Republic of Germany, the DIN is recognized as the national standards organization in the European and international standards organizations. Today 90 % of the standardisation work of the DIN is European and internationally oriented. The DIN is organized by a Steering Committee laying down the principles in standardisation policy and being responsible for business and financial policies:

- by the Executive Committees supporting the Steering Committee;
- by Standards Committees responsible for technical work;
- by Commissions serving to guidance the DIN Director and coordinate fields of activity of the DIN and the interrelation with activities of other institutions.

Other bodies are Coordination Centres. They serve as an important link to the European Commission or other standardisation bodies and ensure the exchange of information. They bundle, systematize and coordinate the norming, standardising and research related activities of the DIN to the respective subject areas.

Regardless, whether norms, standards and guidelines are developed by ministries, public organizations and authorities or by the private sector of the economy, crucial is that the parties who have to keep the norms, standards and guidelines can identify themselves with them. From the German point of view, the development of norms, standards and guidelines under the responsibility of the private sector of the economy has the decisive advantage: the compliance with the regulations. However, it is worth to mention that the process of self-management of the private sector of the economy developed gradually. Another crucial point is that Universities and/or Research Institutes should actively take part in the development process in order to contribute research results to the norms, standards and guidelines.

In this handbook general steps are explained. The main task is to elaborate consensus based norms market-conform and modern (timely) in cooperation with the representatives of the interested parties (experts, figure 8).

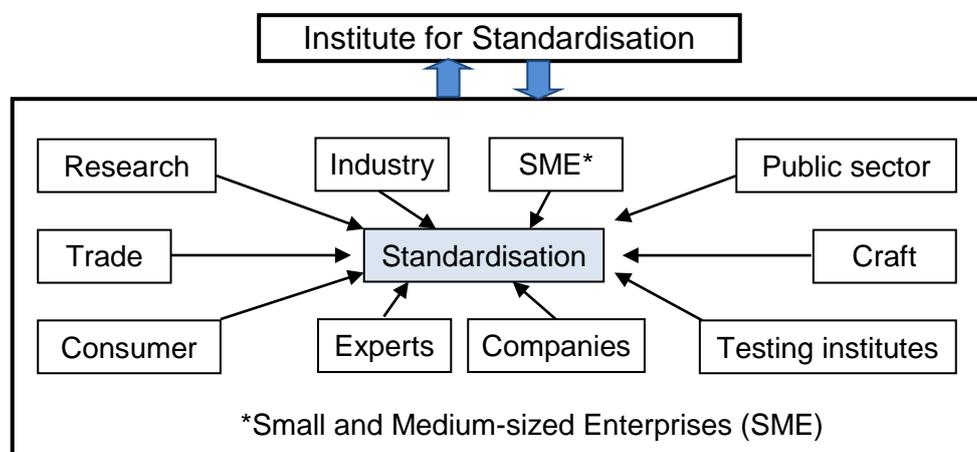


Figure 8: Interested parties in the standardisation process

Norms define material requirements, limit values and standardised measurement methods. The technical work of standardisation on the respective topic is carried out by the Working Committees or the committees in accordance with specified principles, procedural and structural rules. Beside the national committees, there are committees of the European standardisation bodies CEN/CENELEC and the committees of the international standardisation bodies ISO/IEC. If one work in a group for international standardisation (norms) one have points of contact with the European standardisation bodies, too. The work on norms is on a voluntary basis. The working committees of the DIN, for instance, are organized in standards committees according to subject areas. For a specific task of norming in every case only one standards committee is responsible. A clear structure is important.

- The standards committee sends out experts representing national interests at (European and) international level.
- The standardization institute employees organize and guide of the work on norms at national level.
- In order to keep the norms at the highest technological level (state of the art), they have to be reviewed at the latest every five years.
- If a norm does not correspond to state of the art anymore, it is revised or withdrawn.

In addition, norms can be supplemented by sheets containing only information to a norm (elucidations, examples, comments, advices on the application, etc.). The supplementary sheets do not contain specifications which are outside the reference norm; no additional data.

Development of norms at national level

Everyone can make an application for the development of a norm. The application must be justified and should preferably include a concrete proposal. The responsible standardisation committee clarifies the need and the level where the work should be done (national, international). In the case of Germany, the committee has to check if a similar norm activity on the same topic is already being implemented at European level, if so, the norm activity remains undone at national level (standstill commitment). The public gets informed about starting the standardisation work and can comment on it. If the responsible committee decides to start with the standardisation work, and if the responsible steering board agrees, a first draft of the norm is worked out. The manuscript is revised until consensus is achieved to provide a proposal for a norm for public discussion. The Institute for standardization publishes the state of consulting in form of a norm-draft. Everyone can comment on the norm-draft until a fixed deadline. The Committee discusses the comments taking into account the people who have commented. The norm is published if a consensus on the content of the planned norm is achieved and the manuscript for a norm is adopted. The standardisation activity is accompanied by the group for process quality and control of the Institute for standardization at different stages (figure 9). People who had commented but whose objections have not been sufficiently taken into account have the right to ask for arbitration or conciliation procedures within a certain period of time.

In some countries norms and standards are the same thing while other countries as for instance Germany distinguish between norms and standards. In addition to work on norms based on a consensus, the process of working out of specifications is referred to as standardisation in German. Norms and Standardisation differ in type and duration of the

working out process and in its liability. Especially in areas with a high level of innovation, a fast standardisation process can promote and expedite the transfer of knowledge and technology.

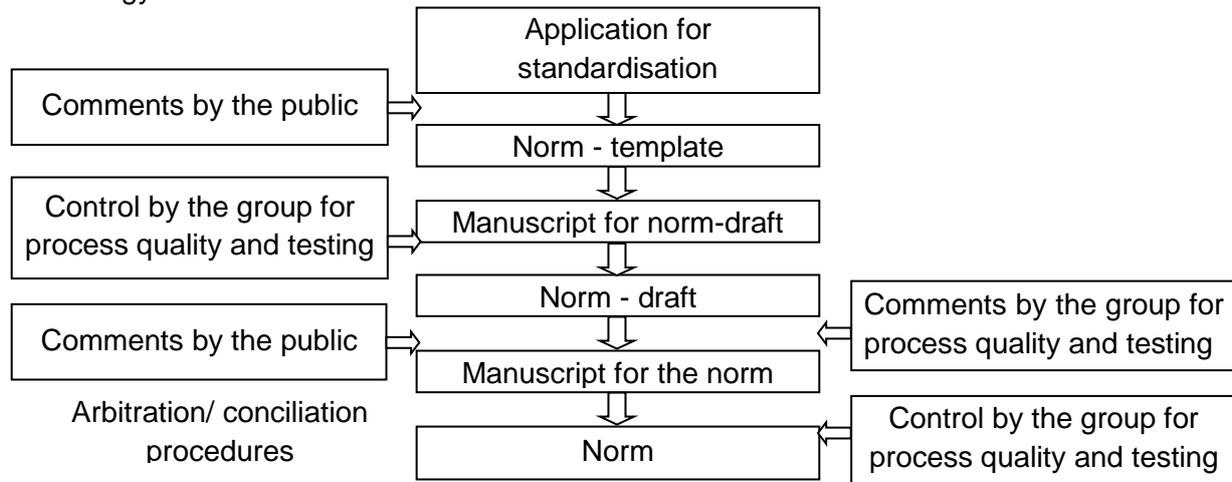


Figure 9: The individual steps of a standardisation activity

The standardisation is a not entirely consensus-based norming with the result of a DIN SPEC, and it does not have the status of a German Norm. A distinction is made between the DIN SPEC (pre-norm), the DIN SPEC (technical report), the DIN SPEC (PAS) and the DIN SPEC (CWA). The pre-norm is the result from the work on norms that are not published by the DIN as a norm because of certain concerns on the content or working out procedures differing to those of norms. After corresponding changes, a pre-norm can be transferred into a norm or it can be withdrawn without substitution (Deutsche Institut für Normung e. V.). According to the procedures of a technical report, the DIN SPEC is either the completed result of a DIN working committee or the adoption of a European or international technical report (TR), thus an assessment report including knowledge, data etc. from norming purposes. The DIN SPEC (PAS) is a publicly available specification describing products, systems or services through defining characteristics and fixing requirements. The DIN SPEC (PAS) are drawn up in workshops (temporarily arranged committees) accompanied by the consulting of the DIN. A consensus of the parties concerned and involvement of all interest parties is not absolutely necessary. According to CWA procedures, a DIN SPEC is the national adoption of a CEN/CENELEC-agreement that is developed within open CEN/CENELEC workshops. It reflects the consensus of the registered persons and organisations which are responsible for the content. Thus there are four procedural rules available for the development of a DIN SPEC. In general, for all DIN SPEC it is that they may be contradictory to another, whereby alternative solution approaches can be parallel tested in practice. However, DIN SPEC may not be contradictory to norms (Deutsche Institut für Normung e. V.).

A very interesting field is the developmental accompanying standardization, which plays a role in today's research with its interdisciplinary joint projects. This work is oriented towards the requirements of innovative partners concerning swiftness, flexibility, technology convergence and internationality. The developmental accompanying standardization affords an effective contribution to the research and development and the market launch of innovative products and services. Thus, it creates a uniform knowledge base for all project partners. In particular, if research projects are publicly funded, standardisation supports the verifiable application.

4.2. Guidelines

By means of guidelines, legislative specifications are put into the water management practice. New solutions and process technologies are developed which meet the challenges of a modern, integrative water and environmental management. Standardized technical precepts make a significant contribution to an effective and sustainable water protection, nature protection, and to the protection of material goods. They ensure the quality in technology, economics, science and administration.

The guidelines have to include statements on planning, construction, operation, maintenance and inspection of facilities as well as on sustainable use of water and soil. The technical guidelines for water supply define the safety-related, hygienic, environment-related and organizational requirements in this sector as well as those for water usage. The guidelines apply to the planning, construction or production, respectively, inspection, operation and maintenance of facilities, establishments and products for general public supply of water and its usage. This includes qualification requirements for companies and persons that are occupied with the above mentioned works as well as with quality of water. It forms the basis for examination (testing) and certification of products, procedures, companies and persons.

A guideline can consist of worksheets and pamphlets. The guideline can be used for vocational education and training and at the same time for knowledge transfer, as well. Worksheets and pamphlets have to be written shortly and comprehensibly in order to be able to give the users reliable instructions and recommendations for action. Worksheets differ from pamphlets in the degree of their recognition and the testing in practice. In Germany, for instance, parts of the guidelines are increasingly incorporated into the European norms.

For the implementation of legal requirements, worksheets have the function to describe technical processes, facilities, operational modes and measures which have proved their worth in practice and which are – according to the expert conviction of the persons working in the specialist field concerned – considered to be technically impeccable and economically efficient solutions. Worksheets contain process and operation descriptions as well as dimensioning information. The worksheets are developed by specialized committees and are subject to a formal public validation procedure.

Pamphlets have the function to give recommendations and support for the solution of technical and operational problems as well as for quality management. They can provide additions to worksheets and describe methods, installations, operational modes and measures (e.g. for the achievement of given environmental objectives – like the improvement of the structure of water bodies) which do not yet fulfill the conditions for a recognition in a worksheet. Pamphlets can – in case the statements they provide are confirmed in practice and they gained recognition in the specialist field concerned – be transferred to worksheets. They can serve for scientific procedure descriptions, e.g. the determination of evaporation of land and water surfaces. Pamphlets are developed by specialist committees. The specialist public is involved according to a defined procedure.

It is also possible to assemble a worksheet and a pamphlet in a single guideline. In this case one has to take in consideration, how to combine the different development processes and how to assembling the information on technical processes (Worksheets) and the recommendations (Pamphlets) together in the single guideline for a specific topic.

The most often used guidelines in Germany are guidelines from the DWA (German Association for Water, Wastewater and Waste) and from the DVGW (German Association for Gas and Water). The DWA and DVGW are politically and economically independent organisations. They represent experts and executives of municipalities, universities, engineering offices, authorities and companies. The guidelines are based on the current level of technological knowledge taking into account functional reliability and safety-related, hygienic, economic and ecological requirements. The DWA provides uniform rules for water management, landscaping, soil protection, wastewater and waste technology. The DVGW provide guidelines for the sector of water and gas supply. It is worth to mention that the DWA as well as the DVGW once started as small organizations. They were not immediately large associations as today.

Developing worksheets and pamphlets

In the following we assume that, an association (similar to the DWA in Germany) is responsible for the development process (but it can also be an Institute or an Authority), crucial is the procedure as such.

Firstly, it is necessary to describe the hierarchy of the individual committees in order to explain the procedures for the development of worksheets and pamphlets. The Bodies of the Association normally are a) the general meeting, b) the executive board, c) the presidium. The general meeting is considered the highest committee of the association consisting of all members. The members decide about the bylaw, the election or confirmation of the executive board and the presidium as well as about the economic plans. The presidium manages the association on the basis of the defaults of the executive board. The executive board determines long-term targets of the association, aligns the association's strategic direction and adopts the necessary resolutions to this. Additionally, there is an advisory body, which counsels the presidium and the executive board and elaborates suggestions on guidelines and educational work. The association federal head office is responsible for administrative activities (support of the committee, conduction of educational events, publishing guidelines). In the case of big countries it is recommendable to install federal states offices as well.

National Associations for the regional support of the members are formed (tasks of regional importance to foster the exchange of thoughts and experiences and conduct educational events). Every year, the chairmen of the regional associations report activities and results to the executive board. District Groups can be formed. In terms of organization, they are linked to the national association. District groups foster the exchange of experiences between the members of the national association. On the next level, there are Committees and Working Groups (figure 10). Their function is the preparation and updating of the guidelines. The executive board forms main committees for the discussion and solution of professional issues. Each main committee can form expert committees in order to accomplish their tasks. The expert committees can appoint working groups in order to handle individual issues (e.g. river maintenance, waste water treatment plans). The results of this work are incorporated into the guidelines, further professional publications and the education programmes. Working groups should be abolished after the completion of the tasks assigned (new tasks – new working groups).

However, permanent working groups are necessary, as well for: a) research and development, b) communication and public relations, c) training and work/career, d) events and publications. This is laid down in the rules of procedure of the respective specialist community. A specialist community is, for example, “hydrological science“. The specialist communities are responsible for the accomplishment and deepening of works in particular fields of expertise of the association. The chairman of the expert committee has to be a member of the main committee. Every year, as a rule, the chairman of the main committee reports the implementation and the progress of the work to the executive board.

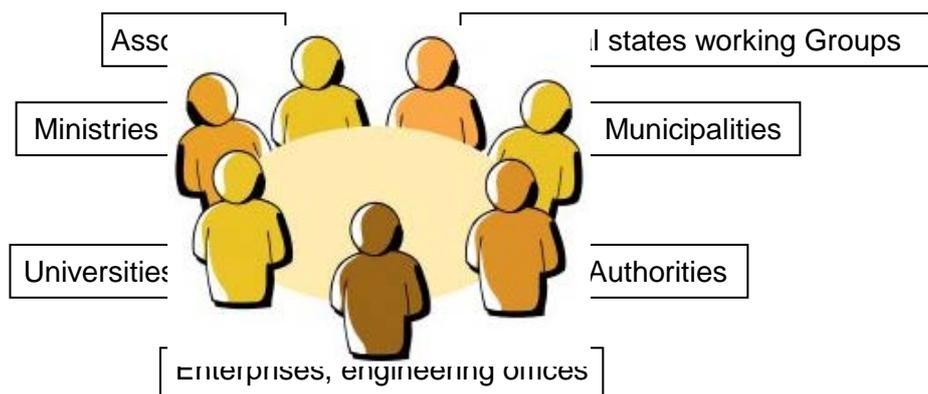


Figure 10: An example of a working group

It is recommendable to install the following main committees:

- Hydrology and water resources management,
- Hydraulic engineering and hydropower,
- Waters and soil,
- Sewer systems (Drainage systems),
- Urban waste water treatment,
- Industrial waste water and installation-related water pollution control,
- Waste/sewage sludge,
- Law,
- Economy,
- Education and international cooperation.

Regarding the composition of the committees and working groups it has to be ensured that the circles of experts who are competent in the specialist field of the relevant committee and working group are appropriately represented and that the latest developments from experience, science and research are incorporated into work. For the management of future projects or projects in hand suitable persons should be appointed in an adequate number. In the committees only persons with appropriate specialist knowledge and experiences should assist. The persons should be in active professional life. The work in committees is voluntary. Committee members should be able to attend meetings on a regular basis since worksheets and pamphlets have to be worked out in a timely manner. For time and cost saving as well as for any further simplified processing of documents electronic communication channels are used as far as possible. The committees can inform the specialist public about their ongoing work by means of work reports which are published in professional journals for example.

The Federal Head Office of the association is particularly involved by:

- Dealing with financial matters of the committees and working groups,
- Organizational support of the committees and working groups for the preparation, holding and the follow-up of meetings,
- Creating links to other bodies and organizations,
- Publishing work results,
- Safeguarding professional interests within the specialized committees as well as against third parties,
- Controlling/monitoring of decision-making results of the committees and working groups.

Initiation of the process: Different “bodies” can initiate the preparation or revision of worksheets and pamphlets: the specialist public, the association-committees, and the federal head office of the association or interested private individuals. Before work is taken up, the necessity is examined and a project description is prepared and published, defining the objective of process. The project description is prepared, usually, by the federal head office and coordinated with the responsible committee. The responsible main committee decides on the commencement of work or the rejection. The initiative steps are shown in figure 11.

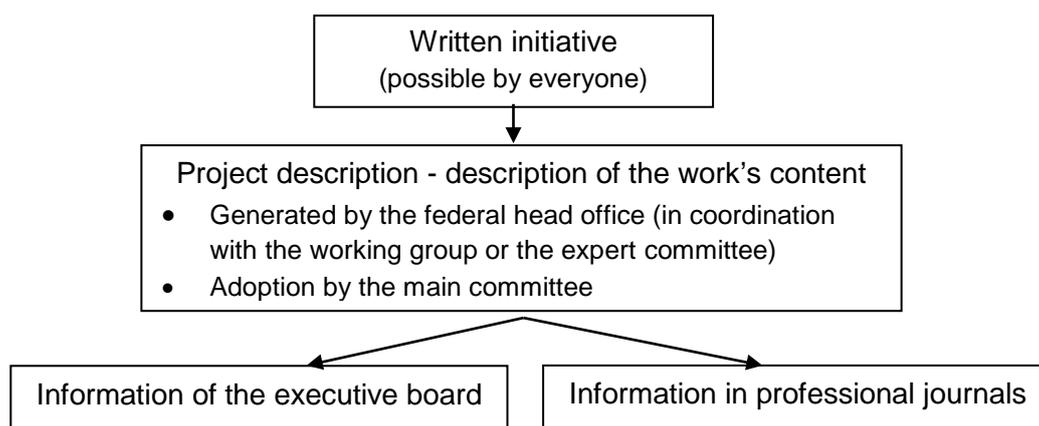


Figure 11: Initiative steps

Worksheets and pamphlets are processed separately according to the subject area and specialist field in committees and working groups. The worksheets and pamphlets can be created in cooperation with specialized committees of other technical-scientific associations, e.g. Association of Engineers for Water Management, Waste Management and Landscaping. The main committee forms the expert committee which is responsible for the editing of the guideline. Working groups can be formed for the processing of separate questions or particular issues.

In order to have a Participatory Process, the commencement of work is announced in professional journals. There it is indicated whether the editing of a worksheet or a pamphlet is intended. In addition, the supreme Federal authorities and the Federal/States Working Groups concerned are informed about the planned editing. In Germany, for instance, such Working Groups are the Federal/States Working Group on Water (LAWA), on Waste (LAGA), on Soil (LABO), on Nature Conservation (LANA) and on Immission Control (LAI). The particular operation steps are illustrated in figure 12.

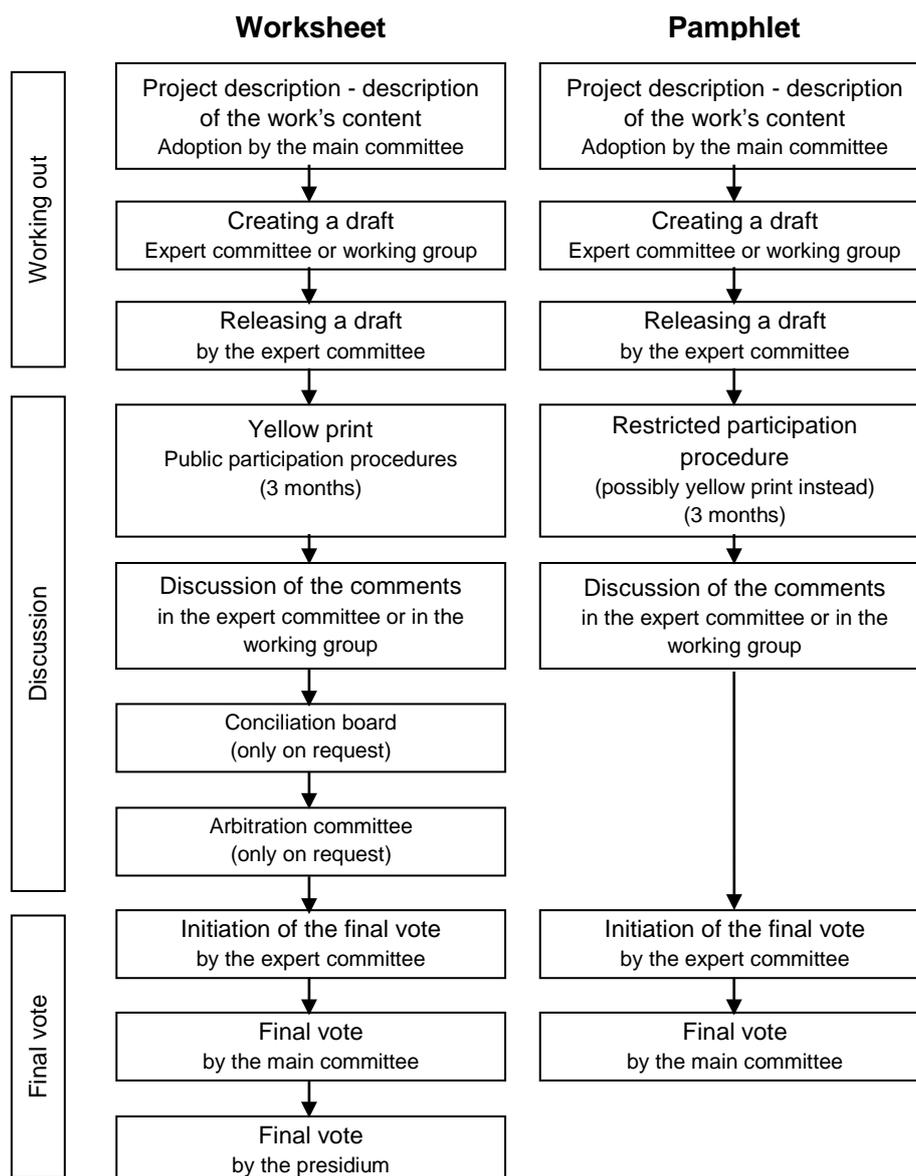


Figure 12: Particular operation steps

The release of the draft (e.g. yellow prints) of Worksheets is carried out by the expert committee. The release is announced to the specialist public in professional journals by pointing to the source of supply and to the period for objection – participation procedure. Additionally, the publication of the yellow print is announced in a Federal Gazette. Everybody can comment on the drafts (consents, objections, proposals for modifications and additions) stating the reasons for the comment within a specified period of time (usually, time frame of 3 months). The comments must be submitted to the federal head office. After the objection period the comments are discussed within the responsible committee (or within the working group). Those who submitted their comments are informed about the result of the discussion of their comments in writing. In case a statement cannot be taken into account, the person who submitted this comment is invited to a discussion in the responsible committee as long as he/she holds his opinion. If no agreement on a comment is achieved, the person submitting his/her comment has the possibility to make a request for conciliation within a

time-limit of one month by restatement – in writing at the federal head office. The request is forwarded to and processed by the conciliation board. The conciliation procedure should be completed within two months after the application for conciliation. If no agreement can be achieved in the conciliation procedure, the applicant has the option to propose for an arbitration procedure. This should be done within a further period of one month after the notification of the decision of the conciliation board.

The arbitration procedure should be completed within two months after the application for arbitration. The duration of the procedure after the yellow print should be completed, if possible, at latest within 18 months after the release of the yellow printout. After 12 months (at latest), the responsible committee should decide whether the work will be continued, a new yellow print will be produced or the project is given up. If significant changes arise during the editing process, a renewed publication of the draft is carried out on the recommendation of the responsible committee, possibly with a shortened objection period.

Pamphlets are created in a simplified participation procedure which is initiated by the responsible committee. Prior to the publication as white print, usually the members of the main committees are involved. The concerned circles of experts are asked for their comments. Concerned circles of experts are: a) Federal Ministries, e.g. environment, agriculture, traffic, economy; b) Federal/States Working Groups on Water, on Waste, on Soil, on Nature Conservation and on Immission Control; c) relevant associations, e.g. water, environmental, municipal and trade associations. The time frame for submitting comments is three months. As long as a broader public participation is considered necessary or appropriate, the draft can also be published as yellow print. The comments are discussed by the responsible committee or working group. An agreement does not have to be achieved with the persons submitting comments. This would also apply, if the draft was published as yellow print.

Final version (e.g. White print) for worksheets and pamphlets: When the participation procedure is completed, the final version of the worksheet is released for publishing by the responsible main committee as well as by the presidium. Unlike this, pamphlets are released for publishing (white print) after internal approval and considering the submitted comments by the respective main committee. The release of worksheets and pamphlets is announced in professional journals as well as in a Federal Gazette. They become valid at the date of issue. Worksheets and pamphlets have to be checked regarding their up-to-dateness at the latest every five years. The decision has to be made whether they can be kept or have to be revised or withdrawn.

In addition to the worksheets and pamphlets, comments can prepared providing explanations and additional background information and pointing out the scopes of actions and the alternatives to standard solutions. In thematic magazines, those results can published which do not appear in worksheets or pamphlets. The technical committees represent their ongoing work in work reports. The reports are published in the professional journals. Furthermore, specialist books including publications concerning current topics in the water and environmental sector can be published as well as training material for craftsman and master craftsman trainings. For the environmental education of children aged 6 to 12 years, it is recommendable to provide materials like VDG-DVD's, calendars, and interactive learning games on topics like water, soil, waste.

In Europe, the DWA is the association with largest membership in this area and has a special position due to its professional competence regarding standardization, occupational training and the information of the specialist public. The primary activity is the development and updating of a uniform, technical guideline as well as the collaboration on the establishment of professional norms and standards at the national and European level. The main purpose of the association is to promote water and waste management, to bring together the experts working in this area and to promote vocational training (advanced training and further education), science and research. This does not only include technical-scientific topics, but also economic and legal issues of environmental and water protection. The same applies to the DVGW in the sector of Gas and Water Supply.

5. Additional methods and activities

One can follow different parallel strategies to implement laws in the water and environment sector into the practice. One possibility is to develop guidelines, norms, and standards, which complement the laws by the state of the art from science and research and promote the self-management of the economy in terms of the environment. Some ancillary options are presented below. It should be noted that due to the variety of available options not all are mentioned here.

5.1. Education for sustainable development

In general, environmental education needs to be improved at all levels of education in order to raise environmental awareness. Environmental awareness serves as a basis for the compliance with water and environmental laws. Environmental education and the joint way towards a more sustainable behaviour must be considered as social learning processes, including all demographic groups. It is crucial that children and young people have paragons who exemplify a proper sustainable behaviour.

Education for Sustainable Development affects all levels of the educational system: learning in day-care centres (kindergarten), schools, youth work, universities, further education and cultural institutions or research institutes. For this purpose, educational institutions can open up for new collaborations. Basically, it is important to incorporate the concept of sustainability (environmental protection) in all educational activities. The compliance with and implementation of laws is easier if the society as well as all individuals are ecology-minded. Therefore, a few examples will be given here.

Environmental education in kindergarten and at school

One of the most important tasks of education is to sensitise children and teenagers for local and global coherences and for behavioural changes in their environment. The challenge of environmental education is to extend the attention and perceptual scope of the children and teenagers on nature. Only those who know the nature can be expected to have the willingness to espouse for the environment in the future. In order to develop environmentally friendly benchmarks among the children and teenagers, the introduction to nature and the environment is extremely important. Education for sustainable development furthers, especially in heterogeneous groups, the quest of constructive solutions through participation, situation and action-orientation.

Kindergarten (Child care centres):

Today, children perceive our environment and nature less and less. They experience the direct environment increasingly rare. However, children should have the opportunity to experience their environment and nature self-dependent. The perception of and experimentation with the phenomena of weather, animals and plants, water and soil is very important for sustainable education. Children are curious and enthusiastic by nature. They have a special sense of their environment and perceive them intensely with all senses. This is where the environmental education must start. Child care centres offer children many opportunities to explore their surroundings. Playful and age-appropriate they get into contact with the relationships of nature and strengthen their child's skills.

In Terms of the selection of topics particular care has to be taken that among the clear reference to sustainable development they can be integrated in the daily routine of the day care centre, without requiring specific natural/spatial conditions or experimental material. The kindergarten and the behaviour of child care workers should serve as a good example. This assumes that they are well educated and regularly take part in advanced training.

The children need to learn to take responsibility for themselves, for their actions and for dealing with nature and the environment. The earlier children are introduced to this responsibility, the more sustainable they will take on this task in the future. In this context, there are numerous connecting factors for the active involvement of children and parents, this also includes sustainability in kindergarten itself (e.g., measures on waste avoidance, waste separation, composting, on reducing energy consumption, selection of local suppliers), in order to strengthen environmentally responsible thinking and acting. First experiences with nature and the environment are important, because children will never again learn so much and so intensely about their environment as in the pre-school age. In this development stage, children make first sustained contacts with the flora and fauna. The eco-conscious behaviour is already shaped here to some extent, as well. In the kindergarten there are numerous possibilities to give children an understanding of nature and environment. For example, through regularly and targeted excursions to the natural environment. There may be interesting landscapes in the surroundings such as forest, heath, marsh, waters or a nature reserve, where children can experience and learn a lot about nature. For the child care workers, it can be helpful if a natural specialist (such as a forester, biologist, and water manager) accompanies the discovery tours.

Learning in Projects:

In the Kindergarten projects on soil, water, energy and climate, food, agriculture, biodiversity, waste management, consumer protection and consumption are provided. By addressing these issues, important skills and values of children can be encouraged, which are necessary in order to be able to shape the everyday life responsible. These include, for example, responsibility, openness and willingness to learn, vitality as well as social, emotional or communicative competence. In these projects, the ongoing documentation of learning processes is very important. This can be done by notes, photographs and diaries, providing the opportunity to remember the process, to reflect, to communicate and to exchange information on activities and experiences to the children, child care workers and parents. The children should get the opportunity to present their project related experiences

to other kindergarten groups and their families. Such events enable the children to look back with pride on their work results and to develop new questions during communication challenging them to new activities. There are a variety of project examples, from which two are described briefly in the following.

The soil as a discovery space for daily kindergarten work provides lots of experience and study opportunities. Right under our feet, there is an own cosmos located, where interesting and exciting things can be discovered. Children love to dig, want to shovel, play in mud, turn round stones and touch small animals. The playfulness of the children must be used to introduce them with simple means (e.g., sticks, spades, hand spade, buckets, sifters, tumbler, cans, cartons, tumbler magnifiers, other types of magnifiers, guide books) to the soil topic. Soil can be excavated with spades, creating small holes in the soil at different locations. This is to investigate whether the soil is spatially homogenous or not. If possible, a soil scientist or a biologist can accompany such activity. By digging the children get to know the layered structure of the soil. They recognize that the soil is a habitat for a variety of organisms (exploring microorganisms, earthworms, roots ...) which have important functions in the development of topsoil. The children will learn about different soil constituents (e.g. sand, loam, clay), and they will discover that plants can be an indication of the prevailing soil conditions in terms of soil type and soil quality. They actively acquire knowledge by investigation and check their theses with "scientific" research methods (e.g. by taking soil samples, investigating soil samples, performing observations, collecting, sorting, analysing, and classifying soils within the limits of their abilities).

Water as a habitat provides many possibilities to investigate the flora and fauna, and offers the opportunities for simple scientific experiments. The required research equipment is quite common: Pots, bowls, glasses, bottles, filter vessels and filter paper, sponges, cotton balls, pebbles, sand, stable paper, pearls, knobs and greensward, sifters. By using water samples from different sources (e.g., tap, mineral water, creek, lake, puddle), it can be investigated to what extent polluted water might be cleaned by filtering or sifting, or which materials can be efficiently used as filter: finely woven or a coarse-meshed sieves? Is the dilution with clean water an option for water purification, or are settling processes better? Is the soil able to clean the water? If possible, visits of waste water treatment plants or water works should be organized. What lives in natural water bodies (flora and fauna)? In the framework project, the children will become aware of the fact that drinking water and water for usage are essential for humans. They will understand that polluted water affects the food chain negatively (e.g. unhealthy vegetables and meat). The co-responsibility of each individual for the long-term preservation of a good water quality becomes evident to them.

Other projects and detailed information can be found at:

http://wwwbsj.org/BSJ/newsletter/2011/pdf/umweltbildung_erziehung_kiga.pdf

<http://www.umweltbildung.de/430.html>

School:

Due to the compulsory education in Germany, for instance, schools are the only institution reaching all people. After school in most cases people complete career training, study at a university or pass through an advanced training. Thus, environmental education in schools is an important process and works on the same principle as in day-care centres (Learning in

Projects). In schools, for example, project weeks are carried out on specific topics. The ideas are manifold and can be co-developed and suggested by the pupils. Furthermore, specific calls are announced for environmental school projects by the environment ministries of the federal states. Numerous of project examples of school projects are available, from which two will be introduced briefly. The first project is "schools to the water - Pupils competition in North Rhine-Westphalia about living waters". The second project is named "school and agriculture". Within the project "schools to the water" young people shall be inspired to get a stronger awareness for intact natural areas. Streams and rivers in the vicinity of the schools are explored and analysed. Questions are answered such as: i) Is a water body in ecologically good order? ii) Are distinct structures missing? iii) What should be improved? iv) What can the pupils be do by themselves? Based on these guidelines, children and young people examined in NRW streams and rivers in their vicinity. Pupils from class 5 to 10 of all types of schools could participate in the project. Extra-curricular groups could participate, as well. The ideas of the pupils were very diverse, ranging from

- The organization of a guided tour along waters for younger school classes,
- An orientation rally at the river with different question stations,
- A guided walk along the river, together with local experts,
- A photo collages or exhibitions "Our river: Yesterday - today - tomorrow",
- The creation of a pupils-oriented glossary from A like "Aue" (river flood plain) to W like "Water Framework Directive" to assuming a river partnership in collaboration with local partners.

The different projects and addition information can be found at:

<http://www.umwelt.nrw.de/umwelt/wasser/wasserrichtlinie/schulenanswasser2011/index.php>;
<http://www.k2biz.de/regionale-wettbewerbe/schulen-ans-wasser.html>)

The project "school and agriculture" illustrates children and teenagers the origin of their food. Children and teenagers become acquainted with the entire value chain of organic products by visiting organic farms, and places of processing and getting introduced into the marketing of organic products. The basics of sustainable food production, the own consumer behaviour and a healthy diet are the focus of events. Extra-curricular learning venues for instance serve clarifying the connection between potatoes and french-fried potatoes or between livestock species and the type and quality of cheese or meat. The schools do not only visit farms, but also processing and marketing places.

There are a variety of other projects such as mountain forest, forest school, water experience, simulation game "Area use instead of consuming", youth workshop energy and technology, river basin dialogue, renewable resources, the forest and I, or travel to the planet of the future. Details on such projects are available under:

<http://www.umweltbildung.de/171.html>

Environmental education aims at creating awareness for the limitations of our livelihood. It aims to promote readiness and competence for an active co-shaping of the environment. The underlying definition of environment includes the natural environment as well as the cultural, technical, built and the social environment. Children and teenagers are braced for shaping their future in order to be able to take reasonable decisions as adults. This is important for the whole society, regardless of whether they will go to a University, learn a trade or work in

social services. Topics such as climate change, precautionary environmental protection and preservation of the ecological livelihoods must represent fundamental contents for early child education in terms of environmental and sustainability education.

The Association for the Protection of the Nature (NABU) in Germany provides a wide range of environmental educational materials and leisure projects for children, youth groups, schools and day care centers. Literature is available in English via:
(<http://www.naju.de/kinderbereich/>; <http://www.naju.de/jugendbereich/>).

Continued education and advanced training:

Education for sustainable development also takes place outside of educational institutions. Extra-curricular and lifelong learning gain importance since traditional learning venues and formal education domains need to be redefined due to rapid change. Education on sustainable development concerns municipalities, associations, organisations, businesses and families. It enriches the life of every individual and opens valuable opportunities through the impartation of design-competences. It is recommendable to develop a comprehensive educational infrastructure in the area of informal learning, and provide new opportunities for the integration of interdisciplinary learning methods and for collaborations with extra-curricular partners, as it is required for the education for sustainable development. In Germany, for instance, a wide range of extra-curricular educational institutions exists. Continuing education and advanced training opportunities are not only offered by Universities but especially by associations in the water and the environmental sector. Such organisations have implemented the “self-management of the German private sector of the economy”, assisted by Universities.

In Latin America, continuing education and advanced training increasingly becomes an important topic. The challenge is, to support this process.

5.2. Neighbourhoods

The construction and operation of water management facilities (e.g., sewer system, wastewater treatment plants) as well as maintenance of water bodies cost a lot of money. Operation can only work efficiently and contribute to environmental and water protection once qualified staff members conduct the tasks. Consequently, special emphasis must be put on the continuous training of personnel. Conducting the right action at the right time can reduce damages and save money. Such training can be offered as part of so-called “neighbourhoods”. Neighbourhoods can be launched in the areas of sewer systems, wastewater treatment plants, waters and flood.

Neighbourhoods are voluntary networks of water management related staff: operators of water management facilities and public sector entities who are responsible for the maintenance of water bodies. Neighbourhoods have no legal form. Usually, 15 to 20 operators of water management facilities are pooled in a neighbourhood. They serve the support of water protection, the waters development as well as the professional, proper and safe operation of facilities.

According to the latest findings in environmental protection, the changes in legislation and - last but not least - based on the state of science, research and practice there is a constant

need of discussion and information. Such information flow is catalysed by neighbourhoods. Neighbourhoods are based on the assumption that difficulties can be solved more efficiently through an intentional cooperation. Another aim is to organise an advanced vocational training for the operating personnel. Consequently, the operating personnel of the respective neighbourhood meet regularly on site (usually two to three times a year) for exchange of experience and for advanced training. The meetings can take place, for example, at wastewater treatment plants, at a sewer operator or close to a water body of interest.

The neighbourhood days are generally organized with practical focus. The participants will be informed about current developments in technique and law. In addition to the exchange of knowledge, neighbourhoods assist in building a network of operating personnel, resulting in mutual consultation and assistance even beyond the neighbourhood days. Thus, an important objective is to organise an assisting network whenever the neighbour needs help or advice. The mutual assistance can be range from the rental of equipment to the substitution in case of emergency. The meetings are financed by an annual contribution to the costs or may be financial supported by the ministries. The neighbourhoods are organized at the regional level via associations. Consistent framework conditions are crucial and support the nationwide exchange. Experienced professionals (e.g. professors, doctors or engineers) in the field of water management provide support on a voluntary basis. While these advisors communicate their knowledge and experience to improve the practical and theoretical qualification of the operating personnel, the bearer of a neighbourhood is responsible for the appointment and supervision of volunteer professionals (advisors) and for the overall organization.

Wastewater treatment plants neighbourhoods:

The neighbourhoods provide continuous further education to the operating personnel. Wastewater masters, engineers and scientists from municipalities, administrative bodies, operating companies, state water management administration, district administrations and universities act as advisors in these neighbourhoods. The advisor is supported by a chairman out of the operating personnel. Through the exchange of experience and further education in the neighbourhoods qualification is continuously improved. Significant costs can be saved by proper and correct operation of the equipment. Members also exchange information on suitable equipment on the purchase of machinery respectively the best suppliers. Thus, down times and repairs through inappropriate handling can be avoided.

With the instrument of benchmarking the neighbourhoods enable internal quality assurance and support performance improvement. They further serve to inform the public about the quality of the effluent disposal. Comprehensive data on the inflow and discharge quality of the wastewater, the degree of degradation and other evaluations are voluntary compiled nationwide and published once a year. Based on such evaluation, every sewage works operator can carry out a self-assessment compared to other treatment plants. The status of wastewater treatment is documented, simultaneously contributing to compliance with the legal framework conditions.

Sewage neighbourhoods:

In the public infrastructure the most important task of the future is the conservation of value of the sewer systems through service and maintenance and rehabilitation. Due to statutory provisions, the examination and maintenance of the sewer systems including access lines has attracted more attention. In the future, a large part of the investments in the water sector will flow into the rehabilitation of the sewer systems. With the neighbourhoods a platform is available that brings together the further education and the exchange of experience of professionals. Qualified and motivated staff members are required who systematically monitor, check, repair and renew the sewer system and the corresponding buildings in order to operate the sewer networks safely and economically sound. In addition to further education, the sewage neighbourhoods provide support to co-operative collaboration of the municipalities and their staff members in the sewer network operation. The neighbourhoods deal with themes such as sewage operation, safety at work, hygiene, accident prevention, smell problems in sewer systems, sewer cleaning, manholes, stormwater tanks and pumping stations. Environmental protection and conservation of the value of sewer networks play an important role in the neighbourhoods, as well.

Waters neighbourhoods:

For those who are responsible for river maintenance the water quality management implicates a wide range tasks. The preservation of natural structures and species-rich river sections and the renaturation of modified water bodies represent central action. Therefore, high requirements are imposed on those responsible for river maintenance (municipalities, associations). A good water quality can only be achieved with considerable financial and personnel effort. However, a targeted further education of both the decision maker and the maintenance personnel can significantly contribute to a good quality of water bodies. The aim of the neighbourhood days is to make those actors familiar with the requirements of ecologically oriented waters maintenance and development who are responsible for river maintenance. During the neighbourhood days best practice methods and procedures are introduced to maintain and develop natural water bodies. The participants will get informed on the various conditions that affect the maintenance of waters. Based on the legal requirements topics are discussed such as simple, efficient and cost-effective structural improvement of waters, ecologically oriented flood protection, waters maintenance and development in urban areas, natural-orientated design and renaturation of water bodies, keeping and development of riparian woodland, current legislation and granting opportunities.

Flood neighbourhoods:

Floods are natural events which can never be completely avoided. The information and awareness about the existing flood risk and the knowledge of the capabilities for active defence and for flood mitigation are important requirements for any flood precaution. Target groups of the flood neighbourhoods are regional authorities of active defence and civil protection (disaster prevention), as well as all interested persons affected by floods in a river basin. Similar to the other neighbourhoods, the priority of the work is set on the exchange of experience and the further education (flood precaution, active defence, after care). Consequently, regular neighbourhood days take place. The contents of the events are

adjusted to the characteristics of the individual river basin. Thus, the events differ from region to region and are offered as a combination of exchanging experience, presentation of lectures and practical exercises. Neighbourhoods can also serve the participating municipalities as a platform for citizen events. Selected technical contents of the flood neighbourhoods are following: Flood action plans, alarm and action plans for active defence and civil protection, explanation of the flood risk maps and interpretation of the hazards, sustainable awareness-raising for the citizens, industry and trade, flood adapted usage and conscious construction, object protection, and behavioural precaution.

The neighbourhood's sewage, wastewater treatment plants, waters and flood publish their activities as an annual report.

5.3. Benchmarking

Benchmarking is a method applied by entities to compare their accomplishments with the other companies by analysing all processes and functions of the participating companies. Benchmarking is one of the most effective ways to integrate knowledge from outside into the own company, because the knowledge worked out in the frame of a benchmarking process is very practice-oriented and has proven to be effective in everyday life. The goal of benchmarking is the identification and implementation of improvement opportunities within the company. In addition, it has a motivational function, since the performances of best-practice companies can serve as an incentive for the own implementation. For the planning of a benchmarking, a weak-points and strong-points analysis of the benchmarking object, the selection and preparation of a criteria catalogue and the selection of reference units have been taken into account. These should be identified on a rational basis as a partner with the best features. It follows the analysis of benchmarking partners. Based on the comparison with the reference unit, hints for improvement are obtained, which can be implemented. Ultimately, a success checks and adjustments of the measures are carried out. The success of a benchmarking project depends on the comparability of the data and the willingness to implement the findings in the company (www.manager-magazin.de; www.gruenderszene.de).

Benchmarking is a part of the modernisation concept. In Germany, for instance, Benchmarking was developed by the water industry itself in consultation with its political partners, and exists a very long (since 1950) in the water supply and wastewater disposal sectors - the water industry obligated themselves to cooperatively develop and refine a conceptual framework for benchmarking. The comparison is based on the basis of indicators, related to today's benchmarking. In principle, benchmarking can be understood as comparing oneself to others and improving one's performance by learning from the best within the comparison group. Thus, benchmarking is an efficient instrument to identify, to get to know and to adopt successful methods and processes from benchmarking partners. Its aim is to optimize processes and to open up potentials for improvement.

Two prerequisites essentially contribute to the success of benchmarking: The voluntary participation and the confidential treatment of information. In Germany, for instance, the voluntary benchmarking is realized by independent private providers. This procedure ensures a high quality standard of the benchmarking projects through free market mechanism (free selection of providers). In addition, competition and the free selection of providers facilitate an optimal adaptation of projects to the respective issues. In terms of

benchmarking, the selection of appropriate comparison partners plays an important role. Due to the large regional differences in the technical, natural or legal marginal conditions, the performance indicators of the benchmark partners may differ from each other. This needs to be considered in benchmarking projects, otherwise it leads to incorrect results. It can be taken into account through the regionalization of benchmarking projects or the use of appropriate benchmarking methods. One can find projects in corporate benchmarking (analysis of utilities as a whole), process benchmarking or comparison of performance indicators. In the projects the water industry ensures that the aspects of security, quality, customer service, sustainability and economy are adequately taken into consideration.

It is recommendable, for supporting the benchmarking to work out and publish a pamphlet, e.g., "Benchmarking in water supply and sewage disposal" or a guideline "Benchmarking for water supply and effluent disposal entities". These provide uniform rules and assistance for projects. Benchmarking contribute to a continuous approval, to modernization and to price stability within the water industry. It contributes to the implementation and compliance with the water laws. And ultimately, such approval benefits the citizens.

5.4. Cross Compliance (example from Europe)

In environment protection, in the food and feed safety, animal health and animal welfare the European Union (EU), for instance, sets high standards in international comparison. Organic farming, integrated farming and the extensive cultivation in mountain areas are exemplary methods which have a positive impact on maintaining organic substance in the soil and which therefore contribute to prevent landslides. In agriculture, environmental-friendly measures and other obligations contribute to soil and water protection. In order to support the "good agricultural practice", the ordinance on "Cross-Compliance" is an important instrument, fixing rules regarding direct payments within the framework of common agricultural policy.

The cross-compliance rules also apply to other support measures, e.g. the agri-environmental measures, equalization payments for environmental specific restrictions or extra payment for compensation for discriminated area up to measures for the support of forest or the support and preservation of less frequent domestic animal races. The direct payments from the EU agricultural budget are used inter alia to compensate for the higher production costs, which arise on farms in the Member States through such high standards in comparison with their competitors in other countries. This means a farmer who does something to protect the water bodies, soil and environmental and has therefore to manage potential restrictions in the usage of its fields or specific aspects of animal husbandry should have no financial disadvantages.

In order to put legal emphasis to this political connection of agricultural payments with the protection standards, the governments of the EU Member States decided on the proposal from the EU Commission in the framework of the agrarian reform in 2003, to make the payments dependent on the compliance with certain obligations through the introduction of the so-called Cross-Compliance. These cross-compliance obligations are subject to all farms EU-wide which receive direct payments or payments under certain assistance measures for rural development (Compensatory allowances for disadvantaged mountainous regions and

other areas, aid for agricultural and forest-environment measures as well as for afforestation, nature and animal protection measures) (www.bmel.de, Jan. 2014).

According to the Ordinance 73/2009/EC, the authorisation of direct payments is bound by strict rules, connected with the implementation provisions of the Member States – in Germany in particular the Direct Payments Commitments Act and the Commitments Ordinance. Regulations with respect to the areas of environment, food and feed safety as well as animal and plant health and protection must be complied. Infringements of the requirements lead to reductions in payments. Moreover, the Ordinance 73/2009/EC commits the member states to maintain permanent grassland. The central implementing rules of the cross-compliance obligations can be found in the Ordinance 1122/2009/EC. According to the Ordinance 1698/2005/EC, which is a comprehensive operational approach, the agricultural enterprises (farmers) have to comply with the obligations in all production areas (e.g. cultivation, livestock holding, greenhouses, speciality crops) and production facilities, even though they are located in several federal states. Since the 1th January 2005 this control and sanction system is a mandatory EU law.

In order to enlighten the farmers and to raise awareness, in Germany the Chambers of Agriculture of the federal states published a brochure "Information about the adherence to the other obligations (cross-compliance)" – Cross Compliance. The brochure is the result of the Federal/States working group "cross-compliance". It represents the status quo and is provided to the farmers. The brochure deals with the appropriate cultivation of arable land in order to avoid erosion. This is related to arable land for which an increased erosion risk due to wind or water has been noticed. In terms of the avoidance of erosion several measures are expedient, for instance measures like leaving the entire straw of previous crops on the soil surface, cultivating intermediate crops, overwintering field grass, nurse crop remaining in winter or windbreak plantings. Furthermore, framework conditions for ploughing arable land are provided, as for example contour ploughing or only season-dependent tillage (direct seed, mulch-till).

A humus balance for the whole agriculture enterprise and investigations on humus content in the soil must be carried out according to scientifically recognized methods and for each unit of cultivation. The compliance of a cultivation ratio of at least three different crops is required. In addition, it is not allowed to burn down stubble fields. Landscape elements such as hedges, rows of trees, copses and field borders are to preserve since they are important for the protection of environment and provide habitats. The same applies to permanent grassland. In addition, basic requirements for the operational management of agricultural enterprises are important, as well. Further EU directives have to be kept concerning these requirements, such as the Birds Directive, the Directive on the conservation of natural habitats and of wild fauna and flora, the Groundwater Directive, the Sewage Sludge Directive, the Nitrates Directive, the Pesticide Directive, the Directive on the prohibition to use certain substances in the animal production, and the Regulation to the identification and registration of animals, the Regulation on food and feed safety, the Regulation on feeding prohibition (feed ban), the Regulation on animal epidemic as well as the Regulations on protection of animals. The farmers regularly receive information on the status of the legal situation and granting opportunities through the Agricultural newspaper. The Chambers of Agriculture of the federal states regularly offer training for farmers.

According to the Sewage Sludge Directive, the application of sewage sludge is only permitted after investigation of soil properties such as the pH-value, the content of heavy metals, the phosphate available for the plants, potassium and magnesium. The application of sewage sludge on vegetable-growing and fruit-growing areas or on soils in zone I and II of water protection areas is prohibited. The same applies for soils in the range of riparian strips of waters up to a width of 10 meters. The Nitrates Directive regulates the application of fertilizers. The concentration of total nitrogen needs to be calculated before fertilizers (organic, organic-mineral), soil auxiliary materials, crop substrates or plant auxiliary materials (with predominantly organic constituents in each case) can be applied. A demand-assessment of fertilizers has to be carried out. With respect to liquid manure, slurry, other liquid organic fertilizers or poultry faeces, in addition the content of ammonia-nitrogen must be ascertained. It is important to ensure a distance of at least 3 meters from the top edge of river banks and to avoid that fertilizer washed-out in surface waters. At a distance of 3 to 10 meters from the top edge of river banks, fertilizers have to be applied by using suitable techniques (e.g. injection of liquid manure). In the case of unplanted arable land at a distance of 10 to 20 meters from the top edge of river banks, fertilizers must be directly processed. Furthermore, according to the requirements of the Fertilizer Ordinance, balance sheets must be compiled. For the storage and filling up of liquid manure, slurry, solid dung, and silage leachate, specific requirements are to be met.

The Pesticide Directive regulates application-provisions, application-prohibitions and restrictions as well as the obligations to produce records and also the protection of bees. Basically, devices for the application of fertilizers, soil auxiliary materials, crop substrates or pesticides must correspond to the generally recognized codes of practice.

Within the scope of the cross-compliance obligations, there is a system of controls and penalties. It is crucial to have nationwide uniform control criteria, focusing on necessities to achieve the protection objectives. The control criteria are described in detail just as the relevant legal provisions in the federal states specific information brochures. Some federal states provide detailed checklists on their websites, adapted to the situation in the individual farm. The relevant specialised law authorities of the federal states are responsible for the monitoring of the farmers. There are systematic inspections as well as additional inspections (cross-checks). The assessment of infringement against the other obligations (cross-compliance) ensured in general by the criteria of frequency, extent, severity and duration. According to these criteria the specialised authority has to classify the infringement as minor, moderate or serious. In cases of non-compliance with the requirements, penalties are enforced in monetary terms. The extent of penalties is defined according to the seriousness of the infringement. It is important to point out that cross-compliance does not replace the Member States special laws. Hence, among the explained cross-compliance obligations the existing obligations which arise from the federal special laws need to be kept, even though they exceed the cross-compliance requirements.

6. Recommendations

Concerning the implementation of laws in the water and environmental sector few basic recommendations and hints shall be given in the following:

- A clear regulatory structure of responsibilities and specific deadlines for the different working steps of the implementation process as well as reports are of importance.
- Monitoring programs are needed in order to evaluate the surface water's and the groundwater's status.
- To ensure data exchange the development of a data base and a water information system is necessary. The data base should be accessible for relevant ministries, water associations and universities.