

Conference of Rhine Ministers 2001

Rhine 2020

Program on the sustainable development of the Rhine



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Kommission zum
Schutz des Rheins

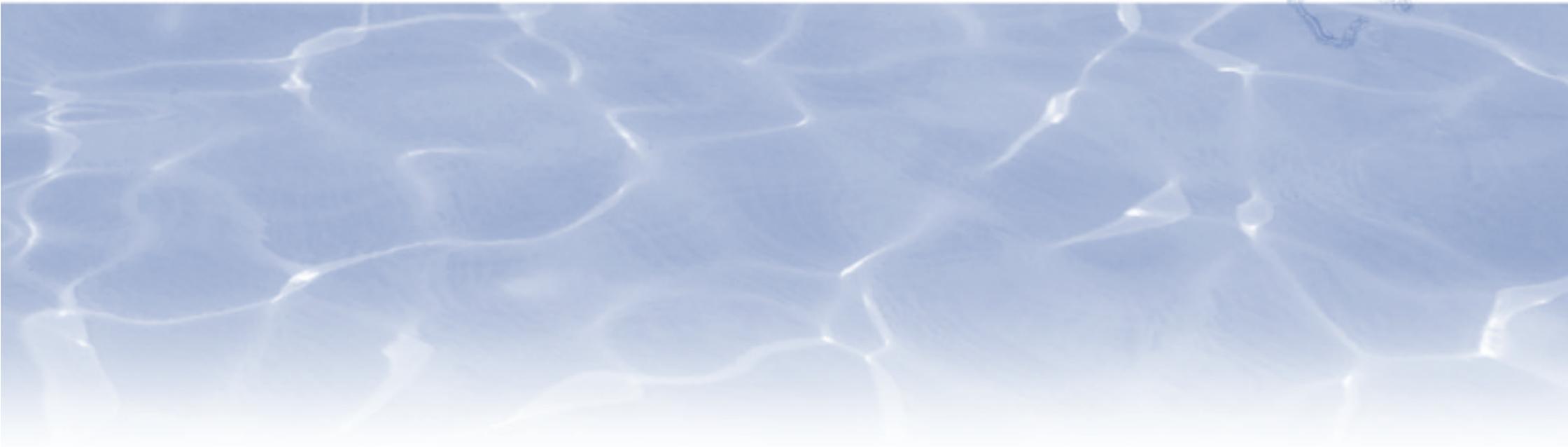
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Rhine 2020

Program on the sustainable development of the Rhine



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Summary

The program “Rhine 2020 – program on the sustainable development of the Rhine” succeeds the successful Rhine Action Program. The focal points of future Rhine protection policy are the further improvement of the Rhine ecosystem, the improvement of flood prevention and protection and groundwater protection. The continued monitoring of the state of the Rhine and the further improvement of water quality remain essential. The program is based on a holistic approach. As defined by sustainable development, the above mentioned fields of action are taken into account comprehensively and on an equal basis.



Important targets of the program are:

Targets

Targets

Flood prevention and flood protection

- In the lowlands of the Rhine risks of flood damage must be reduced by 25 % by 2020 (compared to 1995)
- Downstream the impounded section of the Upper Rhine (downstream of Baden-Baden) extreme flood peaks must be reduced by up to 70 cm (compared to 1995)

Rhine ecosystem improvement

- The former network of habitats typical of the Rhine (habitat connectivity) and the ecological patency (up- and downstream migration) of the Rhine from Lake Constance to the North Sea as well as the patency of the tributaries figuring in the Program on Migratory Fish must be restored.

Targets

Groundwater protection

- Good groundwater quality must be restored
- A balance between abstraction and recharge of groundwater must be ensured.

Water quality

- Water quality must be such that the production of drinking water is possible only using simple near-nature treatment procedures.
- The water constituents or their interaction must not have any adverse effect on the biocoenosis of plants, animals or micro-organisms.
- Fish caught in the Rhine, mussels and crayfish must be apt for human consumption
- It must be possible to bathe in suitable places along the Rhine
- It must be ensured that the disposal of dredged material does not have any adverse impact on the environment.

Targets



The program in hand lists approaches and proposals for measures to be taken in the different fields of action in order to reach the targets of Rhine protection by 2020. Furthermore it presents the instruments to be used, public relations work, the importance of success control and the expenses for the first working phase.

When published in the Official Journal of the European Communities on 22 December 2000, the Directive 2000/60 EU of the European Parliament and the Council establishing a framework for Community action in the field of water policy (WFD) entered into force. The execution of the WFD will contribute to implement essential parts of the program "Rhine 2020".

As far as the scope of the program "Rhine 2020" and that of the WFD are identical, the measures proposed will serve both targets simultaneously. A first work schedule describes possible means of implementation up to 2005. The work schedules to be drafted periodically for the program "Rhine 2020" must put into concrete terms the standards set in the WFD.

Swiss water policy is comparable to that of the EU. Within the implementation of its own legislation Switzerland will therefore support the EU Member States when implementing the WFD.

During the last two years, the program "Rhine 2020" was drafted in an open dialogue between the Rhine bordering countries. Different pressure groups representing nature protection, flood protection, industry, agriculture, navigation and drinking water supply were repeatedly heard. The acceptance of the ICPR program thus achieved in the public is explicitly desired; it is essential with a view to rapidly implementing the various local measures.

1. Introduction

The “Rhine 2020 – program on the sustainable development of the Rhine” defines general Rhine protection targets for the next 20 years. The Rhine Action Program implemented so far (1987 – 2000) showed that the concerted and active implementation of a vast restoration plan in all Rhine bordering countries resulted in an improvement of Rhine water quality nobody imagined when launching the program. On this basis the further implementation of the Ecological Master Plan for the Rhine, the improvement of flood prevention and protection and groundwater protection are focal points of future targets and actions. Continued Rhine monitoring remains essential and the activities aimed at improving water quality must be carried on.

“Sustainability” means taking into account ecological, economic and social aspects simultaneously and at an equal level. So far water policy focused on improving water quality and on important uses. As a consequence, the conservation of an intact stream ecosystem was secondary. Increasingly, the ICPR takes up the cause of holistic water protection as defined by sustainability.

When published in the Official Journal of the European Community on 22 December 2000, the Directive 2000/60 EU of the European Parliament and the Council establishing a framework for Community action in the field of water policy (WFD) entered into force. The following points range among its central aspects:

- All surface water bodies and the groundwater are to return to a good quality status within fixed schedules
- Any deterioration of the quality status of surface and groundwater bodies is strictly prohibited
- An obligation to progressively reduce discharges, emissions and losses of priority substances and to cease those of priority hazardous substances or to phase them out
- Water management on the basis of river basin districts and the obligation to co-ordinate work
- Active involvement of the public.

Swiss water policy is comparable to that of the EU. Within the implementation of its own legislation Switzerland will therefore support the EU Member States when implementing the WFD.

The execution of the WFD will contribute to implement essential parts of the program “Rhine 2020”. As far as the scope of the program “Rhine 2020” and that of the WFD are identical, the measures proposed will serve both targets at the same time. A first work program describes possible steps of implementation

for the period up to 2005. The measures equally cover the catchment area, but they mainly focus on the Rhine as the main stream and on its most important tributaries, such as the rivers Moselle, Main, Neckar, etc.. The work programs to be drafted periodically for "Rhine 2020" must put into concrete terms the standards set out in the WFD.

It is obvious that the ICPR Rhine protection activities must take account of other international conventions on the protection of water bodies, including those on marine water protection (e.g. OSPAR).

During the last two years the program "Rhine 2020" was drafted in an open dialogue between the Rhine bordering countries. Different pressure groups representing nature protection, flood protection, industry, agriculture, navigation and drinking water supply were repeatedly heard. The acceptance of the ICPR program thus achieved in the public is explicitly desired; it is essential with a view to rapidly implementing local measures.

On 22 January 1998 the 12th Conference of Rhine Ministers held in Rotterdam adopted guidelines for the "Program on sustainable development of the Rhine" taking into account improved protection as well as the uses of the Rhine. The new program follows the successful Rhine Action Program and extends the scope of ICPR action.

According to the Ministerial declaration of the 12th Conference of Rhine Ministers the targeted sustainable development of the Rhine refers to the following fields of action:

- Ensure and protect the present high level in the fields of drinking water production and supply, waste water discharge and treatment, safety of industrial plants, preserve stretches of freely flowing water, the Rhine as a shipping lane;
- Holistic approach, interlock and integrate all sectoral measures in the following fields: improvement of water quality, flood prevention and protection, protection and improvement of the ecosystem and groundwater protection;
- Use of modern river district management instruments: auto-control, modernised Rhine monitoring, reinforced sole responsibility and support of environmentally compatible farming;
- Improved public relations and dissemination of information due to target group oriented public relations work, contributions to environmental education and the creation of online information systems.

The program on the sustainable development of the Rhine puts into concrete terms the general targets set out in Article 3 and the principles of Article 4 of the new Convention on the protection of the Rhine. According to its preamble and on the basis of a holistic approach the Governments work towards the sustainable development of the Rhine ecosystem

taking into account the valuable character of the stream, its banks and its alluvial areas. On the other hand they are quite conscious of the fact that the Rhine is an important European shipping lane serving different uses.

Apart from navigation these uses are in particular the production of drinking water, waste water discharge, power generation, fisheries and other. In future, integrated water management must interlock all relevant water-related fields of policy and activity along the Rhine. In cases of diverging economic and ecological targets the competent authorities must carefully consider the interests of those concerned.

It is expected that climate changes and their effects (water regime, temperature) will have to be integrated into subsequent phases of the program.

Success control is an essential part of the program.

2. Targets and approach





“Rhine 2020 – program on the sustainable development of the Rhine” sets general targets for the sustainable development of the Rhine ecosystem and precise targets, parameters, numerical standards and locally differentiated measures for the different fields of work. The targets fixed for ecosystem improvement, flood prevention and protection, water quality and groundwater are detailed in the chapters below.

Double listings of targets and measures are intentional. Often the positive effects of measures become apparent in different fields of action and thus underline the integrating character of the program (see matrix annexed). E.g. measures aimed at creating a habitat connectivity and those aimed at improving flood prevention must inevitably be combined. Both targets concern the same areas, the present and former flood plains along the Rhine and its tributaries.

2.1 Ecosystem improvement



The variety of habitat structures along the Rhine still shows considerable deficits. Some stretches of the originally freely flowing Rhine and of numerous tributaries, such as Moselle, Main and Neckar have been turned into a series of impoundments. Numerous river training measures along the Rhine and almost all of its tributaries have fundamentally changed the hydrological and morphological conditions. More than 85 % of the flood plains have been cut off the Upper and Lower Rhine leading to a considerable loss of habitats and of animal and plant species typical of the Rhine. The implementation of the Ecological Master Plan aims at counterbalancing this development.

Targets

The most important targets defined in the “Ecological Master Plan for the Rhine” are the restoration of the main stream as backbone of the Rhine ecosystem and its main tributaries, their functioning as habitat for migratory fish and the preservation and protection, the improvement and extension of areas of ecological importance along the Rhine and in the Rhine valley presenting habitats for autochthonous plant and animal species.

Combined with the requirements of the Habitats-Directive¹ and the Birds Directive² the measures aim at **restoring the habitat patch connectivity and the ecological continuity (up- and downstream migration)** of the Rhine from Lake Constance to the North Sea, including the tributaries figuring in the migratory fish program.

It is now necessary to draft targets for the development of the different sections of the Rhine and to execute measures aimed at reaching these objectives as well as the overall target.

Procedures and measures

The improvement of the ecosystem and the restoration of the habitat patch connectivity from Lake Constance to the North Sea are put into the following concrete terms:

Along the Rhine and in the lowlands of the Rhine

- 1 Reactivate at least 20 km² of inundation area along the Rhine by 2005 and 160 km² by 2020³, preferably by relocating dikes, that is by permitting natural flooding and dynamic processes typical of the alluvial areas, such as erosion and filling-up by sedimentation
- 2 Protect valuable alluvial ecosystems or designate nature development areas along the Delta Rhine, among others in order to preserve and increase biodiversity, e.g. within the Habitats and the Birds Directive.
- 3 Enhance extensive agricultural use of the alluvial areas and draft development plans for a sustainable use of the alluvial areas, e.g. within the Habitats and the Birds Directive.
- 4 Restore the links of at least 25 oxbow-lakes and lateral water bodies with the Rhine river dynamics by 2005 and of 100 by 2020 and restore the formerly existing hydraulic and biological links between the river and its alluvial area in order to promote the development of biocoenosis adapted to these living conditions.
- 5 Increase the structural diversity of at least 400 km of suitable river banks of the Rhine by 2005 and of 800 km by 2020, taking account of security aspects for both navigation and individuals.
- 6 Establish environmentally compatible water management as a contribution to the ecological up-grad- ing of the Rhine and its lateral water bodies
- 7 Develop near-nature riverbed structures by admit-

ting or encouraging the dynamics of the river bottom in suitable sections of the Rhine and main- taining gravel deposits outside the shipping lane and/or taking measures aimed at improving the bed load transport.

- 8 Develop and implement measures aimed at re- ducing the so far too vast river bed erosion in the Rhine downstream of its impounded section.
- 9 No technical deepening of the river bed without any appraisal of the ecological consequences.
- 10 Increase and adapt the water regime in the old bed of the Rhine (Kembs-Breisach) and in bypass rivers.
- 11 Preserve the freely flowing sections of the Rhine⁴.
- 12 Restore the ecological patency of the main stream, e.g. by constructing rivers or migration devices (e.g. fish passages) bypassing impoundments.
- 13 Protect intact spawning grounds and juvenile fish habitats and revitalise suitable fish habitats in the main river.
- 14 Take account of ecological requirements when extracting gravel or sand from the bottomlands of the Rhine.

In the Rhine catchment

- 15 Encourage biodiversity by extensive use of at least 1,900 km² of agricultural land in the Rhine catch- ment by 2005 and 3,900 km² by 2020³. Encourage biodiversity by nature development and
- 16 afforestation of at least 1,200 km² in the Rhine catch- ment by 2005 and of 3,500 km² by 2020³.

- 17 Reactivate at least 300 km² of inundation area in the Rhine catchment by 2005 and 1,000km² by 2020³.
- 18 Renature at least 3,500 km of streams in the Rhine catchment by 2005 and 11,000 km by 2020³.
- 19 Take account of ecological criteria when oper- ating flood retention areas; plan multiple uses of retention areas, e.g. reactivation of alluvial areas, environmentally compatible tourism, etc.
- 20 Restore the ecological patency (free up- and downstream migration) of the tributaries listed in the fish migration program, e.g. by con- structing bypass rivers or migration devices, if necessary by tearing down weirs no longer used
- 21 Protect intact spawning grounds and juvenile fish habitats and revitalize suitable fish habitats in the tributaries listed in the migratory fish program.

¹ Directive 92/43/EEC on the protection of habitats or species (O.J. L 206 of 22.7.1992, S. 7; FFH=Flora-Fauna-Habitat, NATURA-2000). Last amended by Directive 97/62/EG (O.J. L 305 of 8.11.1997, p. 42)

² Directive 79/409/EEC on the preservation of wild living bird species (O.J. L 103 of 25.4.1979, p. 1). Last amended by Directive 97/49/EC (O.J. L 223 of 13.8.1997, p. 9)

³ Figures correspond to the Action Plan on Floods

⁴ taking account of the Franco-German Conventions on the impound- ment downstream of Ilfezheim, in particular that of 6th December 1982

2.2 Flood prevention and protection

The ICPR Action Plan on Floods puts flood prevention and flood protection into concrete terms. The Action Plan on Floods which has been integrated into the present Program was adopted by the 12th Conference of Rhine Ministers in Rotterdam on 22 January 1998.

One of the causes for increased flood threat is that more than 85 % of the former natural inundation areas along the Rhine have been cut off the river as a result of river training, correction and embankment. This development was accompanied by rapidly increasing sealing of the soil surface and soil compaction. These alterations led to a noticeable acceleration of flood waves

and to rising flood crests. At the same time the population density increased and intensive uses developed in the flood-prone alluvial valley. Flood damage risks are particularly high in these areas. It has not yet been possible to stop this development.

The ICPR has disclosed the call for action in the field of preventive flood protection in the Rhine bordering countries until 2020.

The objective of the Action Plan is to improve the protection of man and material assets against floods and to enhance the ecological state of the Rhine and its alluvial areas. 1995 is the starting point for all performance targets.



Targets

- 10 % reduction of damage risks by 2005 and 25 % reduction by 2020
- Reduction of extreme flood levels downstream the regulated sections by 30 cm by 2005 and by up to 70 cm by 2020
- Increase flood awareness by drafting risk maps of the entire inundation areas and the flood-prone areas by 2005
- Improve flood warning systems due to international co-operation and prolong forecasting periods by 100 % by 2005.

Approach and measures

Along the Rhine and in the lowlands of the Rhine

- 1** Increase water retention along the Rhine by reactivating inundation areas (20 km² by 2005, 160 km² by 2020)⁵
- 2** Increase water retention along the Rhine due to technical retention facilities (68 million m³ by 2005, 364 million m³ by 2020)⁶
- 3** Maintain and strengthen dikes; adapt dikes to the level of protection (815 km by 2005, 1,115 km by 2020)
- 4** Implement preventive measures in the field of spatial planning by introducing and promoting uses adapted to the risk of flooding
- 5** Implement preventive measures in the field of spatial planning by 2005 by drafting maps representing the risk of inundation and damage existing in all inundation areas and flood prone areas
- 6** Improve the flood warning systems and double flood forecasting periods by 2005 as a means of damage reduction.

In the Rhine catchment

- Increase water retention in the Rhine catchment by
- 7** renaturing streams (3,500 km by 2005, 11,000 km by 2020)⁶
 - 8** Increase water retention in the catchment by reactivating inundation areas (300 km² by 2005, 1,000 km² by 2020)⁶
 - 9** Increase water retention in the catchment by promoting extensive agriculture (1,900 km² by 2005, 3,900 km² by 2020)⁶

- 10** Increase water retention in the catchment by initiating measures aimed at nature development and afforestation (1,200 km² by 2005, 3,500 km² by 2020)⁶
- 11** Increase water retention in the catchment by promoting rain water seepage (800 km² by 2005, 2,500 km² by 2020) and by limiting future sealing measures⁶
- 12** Increase water retention in the catchment by creating technical flood retention facilities (26 million m³ by 2005, 73 million m³ by 2020).

⁵At the same time this target enhances the ecological improvement of the Rhine and the creation of a habitat connectivity (see chapter 2.1). It also serves the target of groundwater recharge (see chapter 2.4)

⁶If the retention areas are no longer used for intensive farming and if they are subjected to ecological floods, this target also contributes to ecological improvement.

2.3 Water quality improvement

The implementation of the Rhine Action Program has contributed to a noticeable improvement of Rhine water quality. Pollutions from point sources have been considerably reduced so that today the pollution from diffuse sources comes to the fore. If the quality of water and suspended matter both in the Rhine and in the North Sea are to be further improved, primarily water pollution by hazardous substances and nutrients of diffuse origin must be reduced.

Targets

- Permanent compliance with the target values of all substances relevant for the Rhine in water, suspended matter, sediments and organisms
- Cease or phase out discharges, emissions and losses of priority hazardous substances listed in the water framework directive
- Progressive reduction of discharges, emissions and losses of priority substances listed in the water framework directive
- Further reduction of discharges, emissions and losses of priority OSPAR substances in order to achieve concentrations in the marine environment near the background values for naturally occurring substances and close to zero for industrially produced synthetic substances as fixed by the OSPAR Commission and set out in the Sintra Declaration
- Water quality is supposed to be such that using simple, near-nature treatment is sufficient for the production of drinking water.



- Substances contained in Rhine water must neither individually nor in combination have adverse effects on the biocoenosis of plants, animals and micro-organisms
- Concentrations of dangerous substances in plants, animals and micro-organisms must be further reduced
- No excessive production of biomass
- Fish, mussels and crustaceans from the Rhine must be apt for human consumption without any restrictions
- It must be ensured that the disposal of dredged material does not have any adverse impacts on the environment
- Bathing must be possible in suitable places along the Rhine
- Further depollution of the North Sea

Approach and measures

- 1** Continued reduction of discharges, emissions and losses of substances relevant for the Rhine by applying the state of the art and best environmental practice
- 2** Implement the relevant decisions taken by the ICPR
- 3** Update the list of substances relevant for the Rhine and the targets according to the developing state of knowledge, integrating the quality objectives the water framework directive sets for priority substances and priority hazardous substances as well as the OSPAR priority substances
- 4** Implement further measures targeted at reaching the aims set for the priority substances and the priority hazardous substances
- 5** Applying the EU directives concerning water quality: water framework directive (2000/60/EC), IPPC (96/61/EC), urban waste water (91/271/EEC), Nitrates (91/676/EEC), Plant protective agents (91/414/EEC), Biocides (98/8/EC) and others contributes to improving water quality.
- 6** Further develop waste water discharge monitoring systems of authorities and industrial plants integrating auto-surveillance; develop and incorporate uniform ecotoxicological assessment methods (see the relevant work done in OSPAR, the overall assessment of waste water discharge is of importance)
- 7** Further develop the Rhine warning and alarm system
- 8** Promote ecological management of substances in industry and trade, i.e. the development of products representing a lower risk for the environment; close material cycling, integrate environmental protection according to the state of the art into production (prevention: environmentally acceptable products, clean technologies, measures integrated into production, environmentally acceptable raw materials and process materials, eco-friendly management, use of material and maintenance; recycling: close material cycling within and outside the production process; recycling eventually after processing or waste water treatment)
- 9** Develop an assessment method for individual measures with a view to possible effects on other fields of action including a comprehensive assessment by experts
- 10** Promote environmentally acceptable land management, biological farming, measures aimed at extensified land use and entrust farmers with landscape care

2.4 Groundwater protection

Groundwater protection is a new scope of ICPR work. Logically, the first steps are therefore directed towards an inventory. The aim of the next steps must then be to reach the targets set. If necessary, indicator systems must be developed simultaneously. Finally, the groundwater quality must be assessed and relevant measures must be initiated and executed.

In its Article 2, paragraph b) the new Convention on the Rhine defines the relevant scope as “groundwater interacting with the Rhine”



Targets

- Protect groundwater against infiltration of polluted Rhine water and protect Rhine water against polluted groundwater
- Preserve the dynamic and quantitative interaction between the stream and the groundwater, particularly in alluvial areas
- Obtain good groundwater quality by protecting, improving and restoring the bodies of groundwater
- Reverse any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity
- Ensure that groundwater abstraction is no more important than groundwater recharge, that is, restore the balance between abstraction and recharge of groundwater
- Promote rain water seepage and infiltration of rain water without causing any environmental harm

Approach and measures

- 1 Conduct inventories
- 2 Further reduce diffuse substance inputs, in particular of nitrogen and plant protection products by promoting environmentally acceptable agriculture – in Switzerland e.g. by promoting integrated agricultural production; promote biological agriculture and extensive farming.
- 3 The further phases will result from the implementation of the water framework directive.

- Improve the soil ecosystem by restoring the natural dynamics of alluvial areas
- In particular in municipal watersheds: ensure that the vulnerability of groundwater and of the aquifer is taken account of in cases of new land utilisation by industry and trade and ensure that the high level of protection in the field of stocking and transportation of substances hazardous to water is maintained by taking adequate preventive measures in existing infrastructures (industry, busy traffic arteries, stocks of substances hazardous to water etc.) so as to avoid groundwater contamination
- Protect groundwater in cases of further use of flooded gravel pits in the alluvial areas of the Rhine after ceasing to extract minerals



3. Instruments and public relations

Different instruments must be used in order to execute measures and reach the targets set for the various above mentioned working areas; new ones must be developed and used in the field of auto-control. Besides the application of national laws the implements listed will be used to reach the targets.



Instruments to be used to reach the targets

- 1 Reinforce the sole responsibility of dischargers with a view to reducing hazardous substances, apply effective and evaluable voluntary agreements.
- 2 Apply environmental management systems (e.g. EMAS, environmental certification according to ISO 14001, environmental planning, environmental reports)
- 3 Apply voluntary agreements in agriculture, keep area-related data files
- 4 Integrate interested groups into the open planning procedure and into the evaluation of measures within hearings, technical discussions, meetings and the like
- 5 Take account of the requirements of the present program within national or regional spatial planning procedures, environmentally relevant planning procedures or building permissions
- 6 Encourage early involvement of local interest groups and corporate bodies in the production of plans
- 7 Draft voluntary agreements, in individual cases with users (groups of users) concerned in order to guarantee a certain extent of legal security, to safeguard the results achieved on the medium or long term and in order to be able to permit ecological development processes effective on the long term
- 8 Regularly organise discussions along the different sections of the Rhine with persons or groups concerned or interested; this will contribute to a continued exchange of views, at a national and at a transboundary level, which will above all have positive effects on future spatial planning.
- 9 Use mediation procedures in case of projects with a high potential for conflicts
- 10 Initiate pilot projects for the different sections of the Rhine and establish transboundary links between these projects by instituting partnerships in order to underline the importance of the Rhine river system and that of the patchwork connectivity existing between the stream and its alluvial area.

The ICPR will give a new orientation to its public relations work based on a general strategic concept. The public must be informed by means of intelligible material with public appeal.

The strategic concept will include the following elements:

- 1 Define the target groups; who, when, why and how?
- 2 Reinforce general and specialised press work
- 3 Design information for use in schools (documentation, video, CD-ROM, etc.)
- 4 Increase public awareness for the value of water resources, for the esthetic of the river Rhine and for the Rhine valley as a landscape element; this topic in particular must be part of school and adult education.
- 5 Incorporate these facts into the concept of an environmentally acceptable tourism in the Rhine valley (eco-tourism) and implement this concept
- 6 Create comprehensive transparency due to modern online information systems, the ICPR web-site, etc.

4. Success control

Success control is an essential part of the program. Assessments of the state of the Rhine are carried out regularly and according to the standards set in the water framework directive.

Monitoring programs required for success control are running on the basis of the legal regulations of the Rhine bordering countries. Particular instruments must be designed with a view to controlling progress in the field of creating a habitat patch connectivity and the implementation of the Action Plan on Floods.

Instruments for success control:

- 1** Use of co-ordinated assessment systems according to annex V of the water framework directive
- 2** Regular control of the compliance with the target values of substances relevant for the Rhine
- 3** A new instrument must be developed with a view to controlling progress in the field of creating the habitat connectivity. It must be combined with the requirements of the Habitat¹ and the Birds² Directive.
- 4** The effectiveness of measures aimed at reducing flood damage risks must become calculable. Calculation models are under development. Maps illustrating flood-prone areas and areas at risk of flooding in the lowlands of the Rhine visualise the damage risks and their targeted reduction.
- 5** Simulation models also taking account of the effects of measures already implemented will be developed for the Rhine and its catchment in order to control the success of measures aimed at the target "Reduce extreme flood stages".
- 6** The Action Plan on Floods provides for success control in 2005, 2010, 2015 and 2020; all depending on the results, the categories of measures and the schedule may be updated.
- 7** The extent to which targets have been reached in the different fields of action must be defined and regular success control is required.

5. Implementation and expenses

The program will be implemented in several working phases. The first one is running up to 2005. A first rough estimate of the expenses expected for this period amounts to about 5 billion Euro. This sum particularly covers the implementation of the Action Plan on Floods and the ecological improvement of the hydrographic network of the Rhine.

So far the expenses of the contracting parties related to the execution of the entire program up to 2020 cannot be estimated. Measures must be appropriate and cost-effective. The Member States are responsible for their implementation.

It must be taken into account that a variety of regional and local institutions, in particular responsible for financial aspects must participate in the execution of measures, particularly in those concerning ecology and flood prevention.

- ¹ Directive 92/43/EEC on the protection of habitats and species (O.J.L 206 of 22.7.1992, page 7; flora-fauna-habitat, NATURA 2000). Amended by Directive 97/62/EC (O.J. L 305 of 8.11.1997, p. 42)
- ² Directive 79/409/EEC on the preservation of wild living bird species (O.J. L 103 of 25.4.1979, p. 1). Amended by Directive 97/49/EC (O.J.L 223 of 13.8.1997, p. 9)

Effects of the measures with respect to the Rhine protection targets (RPT)

Matrix of effects

Ecosystem improvement

MEASURES

| | RPT ecosystem | RPT floodings | RPT water quality | RPT groundwater |
|---|---------------|---------------|-------------------|-----------------|
| Along the Rhine and in the lowlands of the Rhine | | | | |
| 1 Reactivate at least 20 km ² of inundation area along the Rhine by 2005 and 160 km ² by 2020, preferably by relocating dikes | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● |
| 2 Protect valuable alluvial ecosystems or designate nature development areas | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● |
| 3 Enhance extensive agricultural use of the alluvial areas and draft development plans | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● |
| 4 Restore the links of at least 25 oxbow-lakes and lateral water bodies with the dynamics of the Rhine by 2005 and at least 100 by 2020 and restore formerly existing hydraulic and biological links between the stream and the alluvial areas | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● |
| 5 Increase structural diversity of at least 400 km of suitable river banks of the Rhine by 2005 and of 800 km by 2020 | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● |
| 6 Establish environmentally compatible water management in order to ecologically upgrade the Rhine and its lateral water bodies | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● |
| 7 Develop nature-near river bed structures by admitting or encouraging the dynamics of the river bottom in suitable sections of the Rhine and maintaining gravel deposits outside the shipping lane and/or take measures aimed at improving the bed load | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● |
| 8 Develop and implement measures aimed at reducing the still too vast river bed erosion of the Rhine downstream of its trained section. | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● |
| 9 No technical deepening of the river bed without preliminary appraisal of consequences | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● |
| 10 Increase and adapt water flow in the old bed of the Rhine (Kembs - Breisach) and in bypass rivers | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● |
| 11 Preserve the freely flowing sections of the Rhine | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● |
| 12 Restore the ecological patency of the main stream, e.g. by constructing rivers or migration devices (fish passages etc.) bypassing impoundments | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● |
| 13 Protect intact spawning grounds and juvenile fish habitats and revitalize suitable fish habitats in the main stream | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● | ● ● ● ● ● |

MEASURES

| | RPT ecosystem | RPT floodings | RPT water quality | RPT groundwater |
|--|---------------|---------------|-------------------|-----------------|
| 14 Take account of ecological requirements when extracting gravel and sand from the lowlands of the Rhine | | | | |
| <i>In the Rhine catchment area</i> | | | | |
| 15 Encourage biodiversity by introducing extensive use of at least 1.900 km ² of farmland in the Rhine catchment by 2005 and of 3.900 km ² by 2020 | | | | |
| 16 Encourage biodiversity by nature development and afforestation of at least 1.200 km ² in the Rhine catchment by 2005 and of 3.500 km ² by 2020 | | | | |
| 17 Reactivate at least 300 km ² of inundation areas in the Rhine catchment by 2005 and 1.000 km ² by 2020 | | | | |
| 18 Re-nature at least 3.500 km of streams in the Rhine catchment by 2005 and 11.000 km by 2020 | | | | |
| 19 Take account of ecological criteria when operating flood retention areas; plan multiple use of retention areas, e.g. with a view to the reactivation of alluvial areas, to environmentally compatible tourism, etc. | | | | |
| 20 Restore the ecological patency (up- and downstream migration) of the tributaries listed in the program on migratory fish, e.g. by creating bypass rivers or migration devices, if necessary tear down weirs no longer used | | | | |
| 21 Protect relevant intact spawning grounds and juvenile fish habitats and revitalise suitable fish habitats in the tributaries listed in the migratory fish program | | | | |
| <i>Along the Rhine and in the lowlands of the Rhine</i> | | | | |
| 1 Increase water retention along the Rhine by reactivating inundation areas (20 km ² by 2005, 160 km ² by 2020) | | | | |
| 2 Increase water retention along the Rhine with the help of technical water retention basins (68 million m ³ by 2005, 364 million m ³ by 2020) | | | | |
| 3 Maintain and strengthen dikes, adapt the level of protection (815 km by 2005, 1.115 km by 2020) (by means of ecological floods) | | | | |

Flood prevention and flood protection

●●●● tremendous effect

●●● big effect

●● medium effect

● low effect

▬ no effect

MEASURES

| | RPT ecosystem | RPT floodings | RPT water quality | RPT groundwater |
|--|---------------|---------------|-------------------|-----------------|
| 4 Implement preventive measures in the field of planning by introducing and encouraging uses adapted to floodings | ●● | ●●●● | ●● | ●● |
| 5 Implement preventive measures in the field of planning by drafting maps of flood-prone areas and areas at risk of flooding for all inundation areas and flood-prone areas by 2005 | ●● | ●●●● | ▬ | ▬ |
| 6 Improve the flood warning system and double forecasting periods by 2005 as a means of risk reduction | ▬ | ●●●● | ▬ | ▬ |
| <i>In the Rhine catchment</i> | | | | |
| 7 Increase water retention in the Rhine catchment by renaturing streams (3.500 km by 2005, 11.000 km by 2020) | ●●●● | ●●●● | ●●●● | ●●●● |
| 8 Increase water retention in the catchment area by reactivating inundation areas (300 km ² by 2005, 1.000 km ² by 2020) | ●●●● | ●●●● | ●●●● | ●●●● |
| 9 Increase water retention in the catchment area by promoting extensive agriculture (1.900 km ² by 2005, 3.900 km ² by 2020) | ●●●● | ●●●● | ●●●● | ●●●● |
| 10 Increase water retention in the catchment area due to nature development and afforestation (1.200 km ² by 2005, 3.500 km ² by 2020) | ●●●● | ●●●● | ●●●● | ●●●● |
| 11 Increase water retention in the catchment by promoting the seepage of rain water (800 km ² by 2005, 2.500 km ² by 2020) and limiting further sealing measures | ●●● | ●●●● | ●●●● | ●●●● |
| 12 Increase water retention in the catchment due to technical flood retention measures (26 Mio. m ³ by 2005, 73 Mio. m ³ by 2020). | ●● | ●●●● | ● | ●● |
| 1 Continue to reduce discharge, emissions and losses of substances relevant for the Rhine by applying the state of the art and best environmental practice | ●●● | ● | ●●●● | ●●●● |
| 2 Implement the relevant ICPR decisions | ●●● | ● | ●●●● | ●●●● |
| 3 Update the list of substances relevant for the Rhine and the target values according to the state of knowledge and taking into account the quality targets of priority substances and priority hazardous substances listed in | ●●● | ● | ●●●● | ●●● |

Water quality improvement



MEASURES

| | RPT ecosystem | RPT floodings | RPT water quality | RPT groundwater |
|---|---------------|---------------|-------------------|-----------------|
| the water framework directive and the priority substances of the OSPAR | | | | |
| 4 Implement further measures in order to achieve the targets fixed with respect to the priority substances and the priority hazardous substances | ●●●● | ● | ●●●●●● | ●●●● |
| 5 Apply the EU-directive concerning water quality: water framework directive (2000/60/EC), IPPC (96/61/EC), urban waste water (91/271/EEC), nitrates directive (91/676/EEC), plant protective agents (91/414/EEC), biocide directive (98/8/EG) and others contributing to the targets of improving water quality | ●●●● | ● | ●●●●●● | ●●●●●● |
| 6 Further development of surveillance systems of authorities and companies incorporating auto-control of waste water inputs, development and integration of uniform ecotoxicological assessment methods | ●●●● | ● | ●●●●●● | ●●●●●● |
| 7 Further development of the warning and alarm system for the Rhine | | □ | ●●●● | ●●●● |
| 8 Promote ecological substance management in industry and trade | ●●●● | ● | ●●●●●● | ●●●●●● |
| 9 Develop an assessment method for individual measures with a view to eventual effects on other fields of action, including a comprehensive assessment by experts | ●●●● | ● | ●●●●●● | ●●●●●● |
| 10 Promote environmentally compatible land management, biological agriculture, extensification of agriculture and landscape care by farmers. | ●●●●●● | ● | ●●●●●● | ●●●●●● |
| 1 Conduct inventories | ●● | ●● | ●●●● | ●●●●●● |
| 2 Further reduction of diffuse inputs, particularly of nitrogen and plant protection agents by promoting environmentally friendly practice – in Switzerland e.g. by promoting integrated agricultural production – encourage biological farming and extensification | ●●●● | ●● | ●●●●●● | ●●●●●● |

Groundwater protection

