Council of Europe
Conseil de l'Europe

The challenges facing European society with the approach of the year 2000

A comprehensive regional/spatial planning framework for protecting and managing freshwater resources

European regional planning, No. 60

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Technical report submitted to the 11th session of the European Conference of Ministers responsible for Regional Planning (CEMAT)

Limassol (Cyprus), 16-17 October 1997

Resolution adopted by the European Ministers responsible for Regional Planning

European regional planning, No. 60

Council of Europe Publishing

French edition:

Les défis pour la société européenne à l'aube de l'an 2000: protection et gestion des ressources en eau douce dans un cadre global d'aménagement du territoire

ISBN 92-871-

The challenges facing European society with the approach of the year 2000: strategies for the sustainable development of European states in the Mediterranean basin, No. 59
ISBN 92-871-3227-5

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1. General principles

The last decade of the 20th century trends to be proven a period of historic significance for greater Europe. A process of change of profound dimensions is still very much in progress, transforming the entire continent of Europe. Europe is moving to the beginning of a new millennium conscious of the magnitude of these changes, concentrating its efforts on implementing the most ambitions vision and the hopes of all its peoples.

European organisations, and in particular the Council of Europe and the European Union, national governments, politicians at different levels of decision-making, institutions and other agencies, professionals and academics along with the citizens of Europe are trying to fully comprehend the enormous opportunities opening-up, to respond in a systematic way to the major challenges of our times, to make choices and decisions which are bound to reshape Europe beyond recognition and set the foundations for the future development of Europe and its role in an international context.

Europeans are facing the greatest challenge ever: how to use the extensive experience accumulated and the groundwork laid until now with efficiency, wisdom, vision, courage and conviction in order to build a new humane Europe which will guarantee peace, equity and prosperity for all its peoples.

Since the historic socio-political changes in central and eastern Europe in 1989 and the beginning of a new period for the European Union after the Maastricht Treaty, Europe as a whole is striving through numerous initiatives and programmes to achieve a new balance which will enable and promote the harmonious, sustainable future development of all its territory and peoples.

The new European set-up and the need to establish a dynamic future role for Europe in the international competition impose the need for quantitative and qualitative modifications of the spatial structure of the European space, with specific consideration on the environmental integrity and the efficiency of infrastructure networks.

Sustainability of all development is the most persisting demand of our times. It is in fact an extremely far-reaching notion, as it may be extended to incorporate the right of every European citizen to enjoy the basic human rights. Peace, justice, equity, welfare, quality of living conditions, socio-political tolerance and mutual respect for each other's differences and a concern for our common European and global environment are simultaneously the ingredients and the underlying objectives of Europe's effort to achieve sustainable development.

The sustainable development of the European territory is a widely accepted strategic objective which is expected to enable the implementation of fundamental principles and policies, like the socio-economic cohesion of greater Europe, the improvement of living conditions, the safeguarding of the integrity of the European environment and the creation of the conditions which are needed to support continuous economic development and growth.

The social and economic cohesion of the territory of the European Union is traditionally considered as one of the most fundamental objectives of its policies. The relatively slow progress achieved till now in obtaining cohesion and the narrowing of the development gap between the "centre" and the periphery has proven the existence of a strong interrelationship between the economic and social cohesion and regional planning, as an instrument for promoting spatial cohesion.

The Council of Europe has been moving towards the same rationale, as a result of a continuous process since the adoption of the Torremolinos Charter in 1983. In fact both European Organisations, following parallel routes, are increasingly recognising the need to be collectively and actively involved in the realm of regional planning, in order to achieve major social and economic objectives, which would lead to comparable living and environmental conditions and qualities for all European citizens. The effort of the European Union to develop a "European Spatial Development Perspective" and the work of the CEMAT within the Council of Europe are tangible expressions of the realisation that regional planning is an indispensable instrument for promoting the developmental, and hence the social and economic, integration of the European space.

The integration of the territory of greater Europe through the promotion of a balanced and sustainable development of all its regions is an ambitious objective, and considerable problems, stemming from the size of the geographical area and the large number of nations, organisations and systems involved, need to be resolved. The achievement of this objective largely depends on the definition and implementation of a widely-endorsed comprehensive planning policy, which ought to cover the whole of greater Europe at a strategic level.

This long-term and dynamic regional planning framework should be capable for bridging existing gaps, resolving conflicts, promoting advantages, ameliorating disadvantages and providing for a minimum level of regionally balanced and sustainable development throughout Europe. In the end, the envisaged regional planning strategy will be used as a guide for the efficient and effective distribution, re-allocation and transfer of scarce financial resources, while taking into account the future role of Europe in its wider geographical context.

Europe should find the means to overcome substantial problems hindering its effort to formulate such a comprehensive regional planning policy in order to exploit the opportunities arising from the new social, economic and political environment throughout the continent. Such problems are arising from the diversity of responses to questions relating to:

a) the principles which should underlie a spatial planning policy for greater Europe;

b) the methodology and the objectives for the development and the implementation of such a comprehensive planning policy;

c) whether the envisaged policy will affect other sectoral policies or offset the undesired effects of other policies.

The diversity of possible answers to the above questions is determined by the existence of notable differences in socio-economic structures and systems, administrative organisation, development levels and opportunities, distribution of competencies and responsibilities, etc., among European states. It is therefore essential to intensify a continuous process of consultation and dialogue between all European partners at multiple levels in order to formulate a minimum commonly acceptable approach in the planning of future development throughout the European space. Eventually, the existing variety may be transformed into a dynamic asset for promoting the sustainable development of Europe and the building of its future.

The Torremolinos Charter (1983) and more recent work of the Council of Europe and the European Spatial Development Perspective of the European Union may be used as guides for elaborating on a regional planning strategy for greater Europe. Within this context non-EU member states will have the opportunity to put forward for discussion their own perceptions, aspirations and priorities, in order to produce a strategy which should provide for the sustainable development of all European regions and the creation of a new dynamic role of Europe world-wide, while corresponding to the particular needs of each society.

A greater Europe regional planning strategy should correspond to the values and the long-term interests of Europe in the 21st century and it should be based on the following principles:

a) the strategy should refer to the European territory (member states of the Council of Europe);

b) the strategy will not be binding for the states and it should be flexible and easily adaptable to future needs;

c) the strategy should provide for an appropriate balance between short-term and long-term needs and interests;

d) the strategy should improve Europe's competitiveness in the international economic relations and reinforce its international influence and significance;

e) regional planning policies should lead to the sustainability of future development, the improvement of living conditions and the promotion of social, economic and territorial cohesion, while encouraging, facilitating and accelerating the integration of central and eastern European countries into the family of democratic states;

f) the European natural heritage should be considered as an asset which should not be used beyond its capacity to regenerate;

g) Europeans should be meaningfully involved in the shaping of Europe's future development.

2. Co-ordination strategies and co-operation at European level

The great variety in social and economic circumstances, administrative structures, development stages and the significant diversity prevailing in the distribution of competencies and responsibilities in the realm of regional planning within each European state, as well as the large number of European organisations, institutions and agencies which are, directly or indirectly, involved in regional planning and regional development impose the urgent need to establish adequate co-ordination strategies and to develop a framework and networks for the efficient co-operation between all European partners.

This need becomes more pressing when appreciating the fact that the planning strategy for greater Europe, which is a widely endorsed objective, will become a reference framework for all competent agencies and institutions according to their competency and responsibility at different levels (European, national, regional and local). The implementation of the principle of subsidiarity is an additional reason for actively pursuing these strategies and frameworks.

The Council of Europe, having among its members all European states, and therefore covering the whole of the European territory, constitutes the ideal forum for promoting the necessary level of co-operation and co-ordination in a systematic manner, using its long experience which has been accumulated during the last decades. Obviously, the CEMAT could significantly increase its contribution for promoting co-operation between the member states of the Council of Europe and between their regions, turning this area into a focal concern of its future work.

Other European organisations and in particular the European Union have actively advanced towards the same objective and the experience stemming from numerous and, in many instances very successful, co-operation initiatives which are relevant to spatial planning is extremely valuable for developing an extensive and multi-level co-operation network, covering the whole of the Union and many other European states, through the European agreements and various other policy initiatives (Interreg II and Interreg II c, Phare, etc.).

However, the fundamental objective of ensuring the future sustainable development of all European territory in a consistent and systematic manner opens up an entirely new environment, with ample opportunities for developing innovative planning policy options and possibilities for concerted common actions. Many regional planning decisions and policies affect directly and indirectly extensive parts of the European space, beyond national boundaries, defining new balances, opening-up opportunities, redistributing development prospects.

Cross-border, interregional and transnational co-operation are considered as necessary and fundamental operational instruments for advancing the organisation and the spatial restructuring of the European space. In response to this situation there has been a phenomenal growth of interest in the promotion of multi-level co-operation among many states and regions of greater Europe.

The social and political changes in central and eastern Europe and the strengthening of the European Union have created fertile conditions for deepening co-operation at a European level. There are many forms and levels of co-operation which are being promoted during the last decade (in the political, social, economic and cultural spheres). It is very significant for greater Europe that the Council of Europe and the European Union are both actively and decisively intensifying efforts for strengthening their co-operation and co-ordination in the area of regional

planning. The two joint conferences in Dresden (1993) and in Prague (1995), the establishment of permanent consultation mechanisms, as well as many other important initiatives have demonstrated that co-operation between the two leading European organisations may be regarded as a cornerstone of paramount importance, for the development of a pan-European planning strategy, which ought to cover the whole of greater Europe.

The on-going process of co-operation between the two organisations and the increasing emphasis on co-ordinating policies and initiatives will, among other benefits, help to avoid the duplication of effort and the overlapping of relevant initiatives. The positive results stemming from such a co-operation are already evident in respect to the work done in parallel by the two organisations towards the development of a European spatial strategy for the territory of greater Europe. Obviously, there is a great potential for extending and deepening co-operation and co-ordination between the two European organisations in a more systematic and productive manner.

In fact, co-operation and co-ordination at this level may be considered as the backbone of any effort for shaping the future of greater Europe.

The promotion of multi-level co-operation between member states and different bodies and agencies within the two leading European organisations seems more important and essential than ever. This new climate of intense co-operation should enable each participating state to make a contribution to the shaping of the main lines of a European spatial planning strategy and at the same time facilitate the effective implementation of major policies, transcending national borders.

The Parliamentary Assembly and the Congress of Local and Regional Authorities of Europe (CLRAE) have a long standing experience in the area of regional planning and the enhancement of co-operation with the CEMAT may become instrumental for promoting a new attitude towards regional planning and a new appreciation for its dynamic role in the process of restructuring greater Europe.

Co-operation and co-ordination at different levels should be aiming at the sharing of a wide variety of information on spatial trends, experiences and knowledge between all partners involved. The European Union has encouraged and is participating, along with its member states, in the preparation of a Compendium of national planning systems in a systematic way. At the same time, the CEMAT is working towards the publication of relevant information in respect to all its member states. This initiative, despite its rather limited scope, is considered as an essential step in order to familiarise different European states with the planning systems and approaches of their partners and may be regarded as the foundation for promoting more active and meaningful co-operation on specific initiatives.

The Council of Europe and the European Union should jointly enable, initiate, facilitate and promote co-operation and co-ordination between competent regional and local authorities and communities, throughout greater Europe. The appreciation that many significant developmental and environmental problems are common for most people irrespective of national boundaries, the sharing of objectives and the exchange of information and experiences will:

– most importantly, promote understanding and the mutual respect between the peoples of Europe;

– improve the management and the efficiency of many regional and local services;

– prevent the duplication of long and expensive technical studies, and

– increase the feasibility of many European infrastructure projects.

At the local level, co-operation between communities and competent authorities and co-ordination of policies are based on the rationale that often development decisions on the use of scarce resources are interdependent, have long-term repercussions and affect wider areas than those immediately concerned. Co-operation in the field of spatial planning policy should strengthen the decentralisation of administrative and decision-making structures. Competition between local communities as far as their expectations and objectives are concerned could be transformed into co-operation for pursuing complementarity, partnership and joint development. In fact, this alternative approach may guarantee for greater solidarity and cohesion, increased sensitivity on the protection of our common natural, cultural and historical environment and more sustainable and financially sound development in the future.

The Council of Europe and the European Union should joint efforts for promoting co-operation and building adequate channels and mechanisms for consultation and co-operation with the regions neighbouring the outer perimeter of greater Europe, with particular emphasis to the southern and eastern border of Europe. This co-operation may set the foundations for establishing a new dynamic role for greater Europe in a very competitive international arena and it could concern infrastructure networks, the fostering of economic development and the restoration of environmental quality.

The considerable number of simultaneous initiatives, policies and programmes which are studied or implemented by different actors throughout greater Europe impose the need for establishing efficient and effective co-ordination processes and mechanisms. Thus, all major sectoral policies pursued by actors at different levels of decision-making need to be co-ordinated in order to achieve a coherent and comprehensive regional planning policy, to be used as the guiding framework for our common visions concerning the future of greater Europe. The resulting consistency will reinforce the overall dynamism and accelerate the achievement of spatial and hence social and economic cohesion of the European territory.

The most efficient way for co-ordinating regional planning policies which are relevant to greater Europe seems to be the drawing-up of a European spatial development perspective for the European Union and the formulation of a set of guiding principles for sustainable spatial development for greater Europe. These general policy frameworks, which are essential for achieving the sustainable development of greater Europe, should be consistent and comprehensive in order to enable the overall stream-lining of all major policies for attaining a common and widely endorsed objective.

3. Public participation in different regional/spatial planning procedures in the European context

3.1. Possibilities of public participation

Four main aspects concern the potential for public participation in regional/spatial planning in the European context; these are:

- the right to public participation across European state borders;
- the implications from the wide differences in national planning systems on effective public participation throughout Europe;
- the awareness of European public and local authorities on transnational implications of European problems, strategies and policies;
- the possibilities for improving information and participation of the public in planning throughout greater Europe.

Wide differences exist in the overall approach towards public participation in the various parts of Europe and within these regions as well.

There are countries where public participation is based upon specific constitutional and legislative provisions, well-defined administrative mechanisms and practices, long experience of both the public and the authorities concerned and a public awareness of the possibilities for affecting the decision-making process. The right to participate is well entrenched in the mentality of the general public and supported by specific European Union policies.

In other instances, fundamental transformation is still very much in progress as regards the political system, social structures and the economy in general. Despite notable improvements and the evolution along a parallel path during the last five years, it seems that the resulting environment has not as yet been efficient enough to allow for or to promote active and effective citizen participation in the decision-making concerning regional planning.

The main problems hindering the effort for further improvements in this respect are:

- the salient conservative attitude of institutional agencies and administrative authorities towards public participation;
- the public is not convinced of the reasons for their participation, nor of their ability to influence decisions;
- citizens are not sufficiently aware of their rights to intervene in regional planning and participate in the decision-making process;
- access to information on the issues involved is usually not readily available to the public;
- in some instances public participation seems irrelevant and meaningless,

especially when it is not encouraged at an early stage of the planning process.

The issue of how authorities respond to their obligations not only to allow for, but rather to encourage, public participation in a productive manner concerns Europe as a whole, despite differences in terms of stages along parallel paths. The essential issue in this respect refers to an innovative re-definition of the "public interest" and the way to safeguard it, to this extent there are strong similarities between western and central/eastern Europe.

Transborder regional planning is gradually evolving into a major contemporary necessity. Recent attention given to the regions of Europe by the Council of the European Union and the European Commission, which is manifested in many relevant policies and initiatives, suggest that an equally strong emphasis needs to be allocated to the issue of public participation within the context of transborder regional planning initiatives.

Despite obstacles hindering the effort to establish transborder co-operation in regional development (i.e. the variety of the degree of administrative autonomy, differences between national planning systems and the constitutional/political relations between cooperating agencies), there have been successful initiatives which pinpoint towards possible directions for future action.

The very nature of these initiatives and their dependence on personal networking seems to imply that it is still difficult to attain improvements in direct participatory approaches, available to non-organised European citizens. In fact, prescriptions of how to guarantee the right of the public to influence transborder planning decisions are note readily available without endangering transborder co-operation as well.

Despite obstacles and difficulties, it is clear that the only choice available is to persist with a co-ordinated effort to strengthen links and co-operation at many different levels (national governments, the European Union, the Council of Europe, NGOs, businesses, etc.). Establishing fora for a permanent dialogue and exchange of experience and information is expected to create a new climate, conducive to improving performance in transborder public participation throughout Europe. This approach will accelerate the development of innovative institutions, procedures and mechanisms for promoting the meaningful involvement of all European citizens in the building of the future of Europe.

3.2. Forms of participation of regional/spatial planning systems

In the framework of investigating institutional structures of regional and spatial planning systems in different countries and the opportunities that they allowed for public participation, it must be recognised that there is no simple model of public participation, but rather a spectrum of participation, ranging from pure tokenism at one extreme and full participative democracy at the other. The public could rarely speak with a single voice, and an effective system of public participation is, therefore, always likely, to lead to the expression of a range of conflicting opinion.

There is also a spectrum of relationships between the responsible for planning, and differences are obvious between hierarchical models in which central government plays a key role through national and regional planning; and horizontal models where local communities have the principal power, though subject to rights of intervention by national and regional agencies in

specified cases. Whilst there is a role for single issue interest groups, it is more difficult to understand how public participation can be secured and public interest be engaged in the formulation of regional and national plans.

A wide range of different perceptions as to the scope and performance of planning exists. In some countries, particularly at regional level, the function of planning embraces broad economic objectives and not just land-use allocations.

Each country needs to develop its own democratic structure, sometimes against a background of strong public opposition to state planning, wide-scale private ownership of small plots of land, and a general cynicism about politics and government institutions. Planning creates opportunities for corruption, and although a powerful weapon against this is to open up all decisions to public scrutiny, people are often disillusioned when their views are rejected and where corruption can be suspected. The experience of some states demonstrates the risk of adhering too rigidly to a structure that has fast become outdated, and hence of increasing reliance on discretionary rules, that have been devised initially for exceptional cases, and turning them into the norm.

The emergence of a pan-European context for regional and land use planning has to be stressed as well as the emergence of a concept of sustainable development which looks increasingly likely to mean that those who presently have the most resources will in due course have to give up the most. There is another important purpose of securing public participation in planning, which is to try to counter the growth of an uninvolved and excluded community and the parallel growth of crime and vandalism.

3.3. Participation or consultation of the public, special interest groups and individuals in the regional/spatial planning process

There is often much confusion between public consultation and public participation, although they are, of course, completely separate concepts. Consultation concerns projects which have already reached an advanced stage of planning, while participation takes place much further up-stream and is thus a much longer and much more difficult process.

While it is clear that public participation in the choice of planning policies is an essential part of democracy and that it is vital to ensuring the success of projects, there are two pitfalls which need to be avoided. The first of these concerns participation that is distorted either because large sections of the population are unaware of the opportunities available to them for having their say, or they have difficulties in understanding issues which may be intrinsically complex or poorly presented, or the process is distorted by the purely sectorial actions of not particularly representative groups pursuing their own interests.

The other pitfall is the tendency of public participation to undermine the role, the legitimacy and the responsibility of elected representatives, who run the risk of seeing their role in decision-making diminish, while still having to assume responsibility for the decisions. Participation by the public – which very often means a particular section of the public – must not result in people not elected by their fellow citizens enjoying the same legitimacy as elected representatives, who do have the endorsement of the ballot box behind them and do regularly have to stand for election.

It should be recalled that our political systems are systems of representative, participatory democracy and not systems of direct democracy.

Public participation is inherently a lengthy process (requiring negotiations) and often conflicts with the demands on elected representatives (often concerning economic factors) to act swiftly. Studies which recommend certain actions at specific junctures may no longer be appropriate or may have been overtaken by events only a few months later.

Local planning policy requires genuine decentralisation of powers within each country and hence the absence of supervision by higher authorities. Account has to be taken of possible conflicts that may arise between nationally decided planning policy and policies decided and wanted at local level. In this connection, there is a need to clarify the respective powers of each tier of government (an issue that does, in fact, seem to be on the agenda in many European countries).

Lastly, the involvement of young people is an extremely important factor. Of course, they express themselves differently and the issues need to be presented in an appropriate manner, but it must be realised that young people aged ten to fifteen will be the main beneficiaries of most of the major projects being carried out at present. It is essential for the involvement of young people also to figure prominently in the discussions on town planning.

3.4. The effects of public participation in the regional/spatial planning process

Public participation can be achieved through various means in several countries. It ranges from information and deliberation to consultation or consent, administrative or legal objections, as well as administrative or judicial review. Such rights can be granted to directly affected individuals, third parties, special interest groups, citizens of a given area or the general public as such, i.e. everyone interested in participating in a certain development plan.

Public participation in regional/spatial planning is, just like public participation in other governmental or administrative affairs, an important element of a democratic society. The citizen is not only the passive addressee or consumer, but also the initiator and controller. Given this basic assumption of the democratic value of public participation, what kind of positive and negative effects can result from public participation in the regional planning process?

Such effects can obviously be felt with respect to land use developments, the general economic situation in a certain area and its environment, and some important effects can be summarised briefly as follows:

- public participation as an additional administrative step might generally take more time for land-use developments or the creation of a spatial plan. Such delay can be positive, if it provides for a more thorough analysis rather than a quick but flawed planning. It can be negative, if the length of the procedure outweighs possible benefits, i.e. land use developments become unpredictable in time or frivolous delays are given room.

- in the same way, additional costs can accrue for the authorities drawing up a spatial plan or individual land use developers. The costs of public participation should hence be in relation to the total costs of the project in question and the increase in its quality. Due to the long-lasting effects of uilding and construction activities, whether on a micro or macro level, no-cost planning is, however, not feasible.

- the public opinion and possible reactions towards a planning or land use development project can be realised earlier and thus be taken into account for the finalising of the project.

- the rights of those enabled to participate can be safeguarded better. Such rights can range from individual property rights to more general obligations, like for example the preservation of an intact environment.

- the possible environmental, economic and social impact of a planning or development project can be analysed under a greater scope by enlarging the number of those entitled to participate.

A standardised and fixed scheme of how much public participation should be foreseen cannot be developed for all of Europe. All the member states of the Council of Europe should owe to lead to putting in place a system allowing a real public participation. Obviously, some factors will play an important role such as the allocation of spatial planning powers to the different levels of government or administration as well as between those levels themselves, the particular administrative and legal system, the size of the planning project, and the importance of a project for others.

Excessive law suits are often regarded as negative, which is, however, more a problem of the particular legal system rather than of the spatial planning system as such. Some countries have thus undertaken to limit the judicial review process in the case of planning procedures. Nevertheless, the effects of public participation can be seen as mostly positive. In order to improve the situation, the public should be informed fully and at an early stage, not only about a particular project, but also about the wider implications of their project, its impact in related fields and other correlations.

II. REGIONAL PLANNING FORECASTING FOR SUSTAINABLE DEVELOPMENT

1. The regional/spatial planning of greater Europe in co-operation with the countries of central and eastern Europe

The whole of Europe is confronted with problems resulting from the internationalisation of the economy, the growth of the world population, the simultaneous demographic stagnation in Europe, the huge disparities of economic development, and numerous other factors. Many Europeans see these factors as a threat rather than as a challenge: a threat to salaries, jobs, the welfare state, and the environment of our planet. The search for a new equilibrium, particularly concerning the economy, inevitably leads to conflicts of interest.

Any solutions will only be valid if they enable the social cohesion between the different peoples of Europe to be strengthened, if they take into account the rights of future generations, if they also pay due heed to the limitations of the physical environment and to the way in which developments in other parts of the world affect Europe.

The issues dealt with by the Dresden and Prague Conferences organised jointly by the Council of Europe and the European Commission are becoming increasingly obvious, namely:

- regional planning in the European Union cannot turn a blind eye to the situation in non-member states situated along her borders;

- there is no denying the influence of Community integration on regional planning in countries which are not members of the European Union, especially those of central and eastern Europe.

In order to really integrate the countries of central and eastern Europe within the family of democratic states, one cannot dwell on constitutional reforms and observance of human rights alone, but also, in the areas of economic forecasting and forward planning, start thinking in terms of regional planning in the wider Europe.

The countries of central and eastern Europe are grappling with serious problems of transition, relating to:

- privatisation of industry and land ownership;
- modernisation of agriculture;
- reconversion of heavy industry, including coal mining;
- reconversion of the defence industries;
- improvement of transport networks;
- pollution and nature protection;
- development of a market economy.

In order to solve these problems at a national level, one cannot merely export Western experience wholesale, but should rather help the countries of central and eastern Europe to adopt institutions and methods that are tailored to their needs.

However, the regional planning structures in these countries are highly centralised and notwithstand the principle of subsidiarity which, here as elsewhere, is one that is pursued in most Western countries and advocated in the European regional/spatial planning Charter drawn up by the Council of Europe in 1984.

The countries of central and eastern Europe would be well advised to set greater store by the European Charter, which has lost none of its appeal. At all events, the Council of Europe can assist them in any programmes of legislative reform and structural adjustments to take account of the new regional planning context in Europe.

For greater Europe the problem at this particular point in the development of regional planning is again an institutional one. The question facing the European Union and the Council of Europe is that of the structures required to pursue a regional planning strategy on a continental scale.

The situation with regard to regional planning in Europe is very complex and might best be represented in terms of five intersecting circles:

- the first circle is that of a state's regions which, where they exist, constitute the basic unit, the one closest to the citizen. The regions' endogenous development potential is something that a number of speakers have highlighted. Also, the regions is no monad and works together with other regions within the state and beyond its borders. It is a very dynamic and flexible entity;

- the second circle is that of the states, taken individually and collectively within the European Union;

- the third circle is that of the European Union and adjoining non-member states;

- the fourth circle is made up of the countries of central and eastern Europe that have established machinery for co-operation with one another;

- the fifth circle is that of the territory of greater Europe, of all the states on our continent.

How can one cater for institutions and interests so numerous and varied? The only answers point in the direction of a network drawing on all the economic and administrative agents of regional planning and of consultation between all the authorities concerned at three levels:

- the national level;

- the transfrontier or interregional level in its dual manifestation:
  . between states
  . between self-governing local and regional authorities

- the European and international level.

These three levels have both a horizontal and vertical dimension, vertical for the purposes of structuring relations between different hierarchical authorities, and horizontal in that a dialogue needs to be established at each level between all the agents of regional planning, both public and private.

This network is the challenge of the next few years.

Of course, there is no question of devising a Europe-wide master plan, but rather a reference framework, a permanent dialogue involving all the agents of regional planning on the continent. Such a structure would permit the definition of a regional planning strategy for the wider Europe.

However, as necessary a consultation and forward-planning structures may be, they are not enough in themselves. What is needed are financial instruments – transfers of resources – to serve as incentives and multipliers in the name of the principle of resource equalisation in greater Europe.

Within the context of the European Union's attributions and the sectoral policies it pursues, there is no territorial policy worthy of the name. Since the end of the 1950s various policies have been developed within the Community in areas such as transport, agriculture, energy, the environment, and regional policy, but never until now has there been any desire to see how these policies might influence the territorial organisation of economic activity.

Through its regional policy, the European Commission, however, has endeavoured to adopt an all-embracing approach taking into account a broader range of activities which impinge on regional planning in the geographical areas covered by the Structural Fund and the Cohesion Fund.

Some years ago the Commission launched the Interreg Programme, thanks to which all internal frontier regions in the European Union now receive European funds to promote transfrontier co-operation. Estimating necessary to do more than this, the Commission proposed adding a new section to the Interreg programme to implement transnational co-operation based on regional development projects: there is a place for new experiments in transnational co-operation, naturally with the agreement of the member states, in areas other than floods and droughts.

Mention should also be made of Article 10 of the European Regional Development Fund, which provides for pilot schemes to be launched in the area of interregional co-operation and for regional planning co-operation structures to be set up.

How contribute to the considerable efforts of the central and eastern European countries to adapt to economic change, the market economy and democracy, helping them to include spatial aspects in their efforts with the enlargement of the European Union in view? Through the link between Interreg and the Phare programme it has been possible to take the spatial dimension into account and gradually concentrate European aid on a type of economic development in which regional planning concerns have their place. The Phare and Tacis programmes, the European Investment Bank and the European Investment Fund (a new European guarantee instrument) provide funding for a number of infrastructures or global loans to firms to promote economic development. This is an extremely positive aspect of the relationship between the

European Union and these countries. The question now is: what is the most realistic way of increasing co-operation with these states while taking fuller account of the spatial aspect of their development?

The Phare and Tacis programmes, which are due to run until the year 2000, should be given a greater role as the instruments of regional and spatial planning policy in the various countries concerned and helping to bring these states closer to the time when they can join the European Union.

Although transfrontier co-operation between Community regions and neighbouring non-Community regions is covered under Interreg, there is no specific programme dealing with co-operation between the regions of the countries of central and eastern Europe.

Although one agrees on the importance of transfrontier co-operation for international understanding and the building of a united and tolerant Europe – as the Declaration of heads of state and government of the Council of Europe and the Union's Stability Pact clearly stated – one has also to face up to the financial implications.

For the Council of Europes' part, one should:

- continue to promote transfrontier co-operation, in particular by eliminating legal obstacles and encouraging the conclusion of new transfrontier co-operation agreements and in the reform of domestic legislation in the countries of central and eastern Europe;

- encourage the transnational co-operation, particularly to improve the co-ordination and the coherence of national steps;

- provide a context – at interstate level – for co-operation involving two or more countries of central and eastern Europe in matters relating to regional planning. The programme of assistance for the framing of domestic legislation on regional planning and for the training of regional planning authorities in these countries must be reinforced;

- establish a link between the European Union and the other European states by co-operating with the European Union, if it agrees, in the establishment of a pan-European Forum, which could provide the context for regional planning in greater Europe.

The European Union is trying gradually to identify the main lines of territorial planning policy. For their part, the central and eastern European countries, assisted by the Council of Europe, are working together more and more. The best way of moving things forward in this area is to organise meetings from time to time to share experience and look into how efforts could be combined.

2. Strategies for sustainable development of the northern states in Europe

2.1. Strategies for supporting the development and the coordination of national spatial policies of the northern states in Europe and in the Baltic Sea and the Barents Region

2.1.1. The need for a pan-European spatial planning strategy

There are many reasons that a pan-European spatial planning strategy is needed. Environmental, economic, social and cultural issues are more and more tied together globally. Environmental impacts of development are crossing national borders. But, there are new political, technological and financial means which can be used to guide development in a sustainable direction.

However, political, institutional and financial arrangements such as the structural funds and other sectoral policies of the European Union have not sufficiently succeeded in reducing the development differences and imbalances between the regions of Europe.

Policies have to be integrated. A sustainable and integrated pan-European spatial planning strategy can strengthen European spatial cohesion. Such a strategy can even reduce and eliminate tensions and demarcation lines between rural and urban areas, as well as central and peripheral locations. It can help to reduce and even stop environmental deterioration.

What then could be the elements of a pan-European spatial planning strategy? First of all, it is important to recognise that the economy and the environment are two sides of the same coin. Urbanisation is accelerating. Let us try to make this trend positive by creating a polycentric and balanced system of urban regions that are linked with each other. Infrastructure networks, especially transport systems, should be efficient, environmentally nuisance free and designed to strengthen inter-regional cohesion. Natural resources should be protected and a network of protected natural areas established.

There is an evident need to pool local, regional, national and international experiences in spatial planning. A pan-European spatial planning strategy should certainly not replace national policies and systems. However, coordination is needed, and it is here that the role of the Council of Europe is very important because of the Council's wide and astute experience.

2.1.2. Roles of the regions and local authorities

Several presentations on this theme pointed out the role of the regions and the local authorities. Problems, be they economic, environmental or social, do not stop at administrative borders. The states can reduce their territorial powers; there should now be a switch from local government to local governance, from administrative, political and bureaucratic formalism to flexible activities designed to resolve rapidly and efficiently local and regional problems.

A Europe with regions can be turned into a Europe of regions, where the bottom-to-top direction in the decision-making circuit is stronger, and where regions have more independence to co-operate horizontally with each other.

2.1.3. Northern Europe can serve as an example for pan-European co-operation

Co-operation in the Baltic Sea Region and the Barents Region includes examples of joint action in following the principles of sustainable development. States and regions, which can approach development very differently, jointly tackle common problems and try to find solutions. However, results cannot often be seen immediately since these are long-term efforts. There can already be seen co-operation instead of confrontation, confidence instead of suspicion.

Countries in northern Europe are different from each other. More open labour markets, increasing flows of goods, capitals and ideas can be expected, as well as new infrastructure projects. It is important to involve local and regional authorities in this new co-operation. Low-budget initiatives should also be encouraged and supported. Flexible action, especially in financing, should be taken into use. Joint action and projects between member and non-member countries of the European Union should be promoted.

2.2. Transport infrastructure networks in the countries of northern Europe and links with the European network

Transport networks are traditionally considered to be infrastructure elements of great importance for achieving overall development and the integration of European space.

There is no doubt of the existence of a direct and powerful relation between transport networks and the level of socio-economic development and cohesion. Transport networks, therefore, should not be considered in isolation or apart from other major development sectors, issues and options, as a question of accommodating existing or forecasted traffic demand. Efficient transportation networks may, indeed, become an effective instrument for bridging the gap between the more and the less developed regions of Europe, for bringing the periphery closer to the centre and for addressing problems of economic stagnation in European border regions.

Decisions regarding the planning of European transport networks should directly correspond to a common vision of Europe and its role in the 21st century. Such decisions will influence the degree to which Europe achieves its most fundamental objectives for equity in the spatial distribution of development opportunities and for a balanced sharing of all Europeans in a widespread prosperity. European transport networks need to be planned so as to enable the spreading of socio-economic benefits in an equitable manner throughout Europe, taking into consideration those regions which will be located in-between future transport corridors. The proportion of funds allocated by the European Union for the development of trans-European networks is a convincing evidence of the significance attributed on infrastructure.

Perceptions of the role of future transport links throughout Europe in the 21st century need to be expanded and become part of a wider development perspective. Traditional patterns of transport networks, linking northern European states with the economic centres of the North-West should be enriched by exploiting the new opportunities opening-up from the strengthening of economic relations between Europe and the Far East. The development of these links will surely enable this part of Europe to evolve from a peripheral region into a link of the whole of our continent with enormously significant regions of the world.

The concept of the Baltic Sea being used as a major transportation route connecting all northern European countries offers significant advantages compared with most other available options. The development and upgrading of related infrastructure and mainly ports and the terrestrial links with other parts of trans-European networks will surely have critical effects in achieving strategic objectives which are quite relevant to the whole of Europe.

Despite the extreme value and the environmental sensitivity of the Baltic Sea, developments during the period before 1989 have imposed considerable stresses on the marine environment and coastal areas. Future transport infrastructure should not add to the deterioration of environmental conditions, but rather contribute towards the promotion of sustainable development, respecting the integrity of the local environment.

Northern European states are facing particularly difficult problems for linking up with a comprehensive trans-European transport system, designed to benefit the continent as a whole. However, it is very encouraging and at the same time quite promising that this part of Europe has forwarded new approaches on trans-national co-operation and co-ordination on many issues, including the promotion of sustainable development in many levels and sectors. This positive attitude, which needs to be praised, encouraged and facilitated by all European organisations, creates a sense of collective confidence in the ability of all partners to meet the challenges, despite any problems and the lack of sufficient funds. The CEMAT and most other regions of Europe are taking notice of how northern European countries are dealing with these problems in order to learn from all accumulated experience.

2.3. The future of rural areas and agricultural activities in northern European countries

The rural areas of the northern European countries have highly specific characteristics which must be duly taken into account when devising and implementing any policy relating to these areas.

The extremely harsh climate leaves very few options for agricultural production, an economic activity which is highly sensitive and vulnerable because it generates very little added value and is not very diversified.

Agriculture has been and will undoubtedly continue to be the main interface between man and nature in Northern Europe, just as it is in the rest of rural Europe. Therefore it is appropriate to consider the future of this fragile yet important economic activity in the rural areas of Scandinavia.

Incorporating the agricultural activities of northern European countries into the European Union's common agricultural policy (CAP) poses many problems. The CAP, which was designed for a small number of countries and aimed primarily at making the European Community self-sufficient in food, has been put under great strain by the successive enlargements of the European Union to incorporate new member states.

The opening up of Europe to the central and east European countries, where agriculture and the food industry are of great importance and there is potential for many types of agricultural production to be developed quickly, is likely to create serious problems for agriculture in Europe's northern regions which have always had to cope with major natural handicaps.

More than anywhere else, the inhabitants of the rural areas of northern Europe must seize the opportunities provided by new information and communication technologies to set up economic activities complementing agricultural activities, such as tourism and teleworking, in order to prevent rural depopulation.

The economy of these vast areas should be diversified and generate more added value, particularly through the new information technologies, but this is no easy task in a period of weak growth. Rural infrastructure and public services must be improved in order to attenuate the peripheral nature of these regions and narrow the gap that has opened up between the standard of living in the countryside and the towns.

At European level, therefore, specific policies should be devised and programmes implemented which cater better for the different needs and problems of the various rural areas of Europe, in particular by applying certain rules differently as between one area and another.

Forestry is a major factor in the environment and the rural development of northern European countries.

The forestry policy of these states must focus on the preservation of forests and their sustainable and environmentally-sound management. The health of forests must also be preserved, which means taking appropriate measures to reduce air pollution which is harmful to forests.

A more systematic approach must also be adopted to the relationship between forestry and agriculture, in order to co-ordinate these two major factors in the rural economy more effectively with other national or European policies.

2.4. The specific spatial and environmental problems of the regions of the North of the Baltic Sea and the Polar Arctic regions

The northern Baltic Sea regions and the polar regions face specific problems which require a concerted, co-ordinated response from all operators present in this important part of Europe.

The region's peripheral location, harsh climatic conditions, vast open spaces and low population density, and the traditional lifestyle of the indigenous populations, mean that local authorities must make greater efforts than elsewhere to ensure sustainable, balanced development of these areas and a decent standard of living comparable to that in other parts of the continent. Exploitation of the major natural resources in the region is likely to cause

serious environmental protection problems unless appropriate measures suited to the climatic conditions are taken quickly. Economic activity in the region is based primarily on the exploitation of natural resources, fishing and reindeer husbandry.

Following the political upheavals of 1989 and 1990, a governmental co-operation body (the Barents Council) was set up by the Nordic states, whose future economic, political and environmental development is likely to have significant consequences for the whole of Europe.

At a time when many issues are taking on a global dimension, spatial planning policies must also take into account the need to safeguard the rights of future generations.

Major European regions which share common characteristics, concerns and hopes must join forces to meet the challenges facing current and future generations. This is true of the areas north of the Baltic and the polar arctic regions.

The formulation and implementation of policy objectives necessitate international co-operation, which should not be seen as the sole preserve of states; local and regional authorities should participate at every stage in the definition of these objectives (information gathering, formulation of strategies and policies, implementation of the policies and supervision and monitoring) so that they can perform their own role in the area of spatial planning.

It is crucial that the good spatial planning practice in the northern regions of Europe be continued, extended and diversified. Developing subsidiarity and different forms of crossborder co-operation is essential to the success of efforts to achieve sustainable development. The Nordic area may be considered as a kind of testing ground for the arctic regions.

Initiatives such as VASAB and HELCOM are good examples of regional co-operation, and should generate other similar forms of co-operation.

Special priority should be given to setting up a modern maritime and rail transport infrastructure, rapid assessment of the degree of environmental pollution and gradual implementation of the measures required in order to ensure effective preservation of these parts of the globe.

Existing international agreements on the protection of these regions must be strengthened with a view to bringing about closer co-operation between the states concerned.

3. Forecasting for sustainable development of the states of the Mediterranean basin

3.1. Economic and planning consequences for the Mediterranean states of Europe's opening up to the East

The demands of global competitivity have planning implications for Europe as a whole and, in Europe, for its main constituent areas.

Working out a comprehensive and consistent planning policy for each of these major areas should help to avoid further widening of the gaps in territorial development. The Mediterranean basin is undoubtedly one of those major areas which, because of its geographical position, is subjected to very different pressures to the south and to the north. The fact that the thrust of development in greater Europe is increasingly directed towards the centre of the continent may cause economic activities in the Mediterranean region to be weakened and sidelined: in the wake of recent developments in central and eastern Europe, trade relations with countries on the southern shore of the Mediterranean have substantially decreased, while those with the countries of eastern Europe have increased.

Development is at present very uneven in the Mediterranean area. There are also differences in living conditions and social and demographic situations and developments in this area will have a marked impact on spatial planning in the Mediterranean. Moreover, the Mediterranean states, albeit to differing degrees, produce and export comparatively basic commodities, which therefore carry little value added, and this is not conducive to their future development.

Consolidating peace and stability in the countries of the Mediterranean basin must be regarded as one of Europe's priorities for the beginning of the next century, justifying the introduction in this geographical area of an adaptable planning policy co-ordinated with those covering other parts of Europe. Europe as a whole will benefit from the growth of prosperity and stability in the Mediterranean region.

The states of the Mediterranean basin should jointly frame the strategies they consider likely to solve their problems, define priorities for implementation and pull more closely together so as to be in a better position thereafter to co-operate with the other European states.

One of the challenges facing Europe in the next century is to integrate the European countries of the Mediterranean basin more effectively with the other European states while also promoting complementary development between these states and those of the southern shore of the Mediterranean.

Considerable efforts will have to be made to support sustainable development and the necessary structural changes. In this context the Council of Europe should pay special attention to the need to gradually involve women in development processes in these states.

Support measures for the states of the Mediterranean basin will have to be geared to keeping people in their countries of origin, which probably means gradually revising trade relations with the states on the southern shore of the Mediterranean, improving co-operation in all major areas (i.e. social and economic sectors) especially in vocational training, and providing financial support for the launching of large-scale infrastructure schemes.

The natural environment of the Mediterranean cannot be protected in practice if the imbalance between the states of the Mediterranean basin is too great. The current deterioration of the environment is bound to intensify, at least in the short term, in a situation where several states have a steadily growing population keen to speedily attain living standards comparable to those of the neighbouring states.

Action must be taken to ensure that southern Europe no longer feels sidelined in relation to Europe as a whole, but regards itself as the centre of the European continent and its link with the African continent, with which closer co-operation will have to be established.

3.2. Mediterranean interregional co-operation and European networks between medium-sized towns on the shores of the Mediterranean

Many forms of co-operation in a variety of areas already exist between local and regional authorities in the Mediterranean basin. This co-operation, which involves exchanges of information, experience and views on various issues, is very important because it can help to speedily improve the management and efficiency of many local and regional public services; it can also prevent the duplication of long and costly technical studies on the same subject and the construction of some major infrastructure facilities which may then prove to have been overestimated in terms of local and regional users' real needs.

So it is important to support these co-operation networks between towns or regions and explore ways of achieving, together, more effective co-ordination and harmonisation of decision-making on major local and regional projects in areas such as tourist and urban development, cultural programmes and the processing of solid and liquid waste. These decisions are often interdependent and affect the current and future situation on those issues in the surrounding area.

Harmonious, balanced and sustainable development of local and regional authorities on the shores of the Mediterranean can be sustainably and economically achieved only if, before any decisions are taken on major local and regional investments affecting the future, consultations of some kind take place between local political and economic leaders. With better co-ordination, there is some hope of reducing various forms of unbridled competition witnessed in the past between European towns, which have proved in the medium-term to be pointless and costly for everyone.

Complementarity, partnership and joint development between towns should be more effectively practised and expanded in the interest of towns and their inhabitants.

Strengthening co-operation between towns and between regions in the Mediterranean is the first essential step towards greater cohesion and solidarity throughout the Mediterranean basin, more sustainable and financially sound development and greater sensitivity to issues surrounding the protection of the natural, cultural and historical environment.

3.3. Transport infrastructure networks in the countries of southern Europe and links with the European network

Transport networks are considered to be infrastructure elements of great importance for achieving overall development and the integration of European space. European states in the Mediterranean basin are facing particular problems for linking up with a comprehensive trans-european transport system designed to benefit the continent as a whole.

There is a quite direct and strong relation between transport networks and an integrative approach to regional development and socio-economic cohesion. Transport networks should not be considered in isolation, as a question of accommodating existing or forecasted traffic demand, but rather as a powerful catalyst for bridging the gap between more and the less developed regions of Europe, for bringing peripheries closer to the centres and for addressing problems of economic stagnation in European border regions. Decisions regarding the planning of European transport networks should directly correspond to a common vision of Europe and its role in the 21st century, as these networks may become an instrument for promoting European integration. Such decisions will influence the degree to which Europe achieves its objectives for equity in the spatial distribution of development opportunities and for a balanced sharing of all European peoples in a common prosperity. The proportion of funds allocated by the European Union for the development of trans-european transport networks is a tangible proof of the importance attributed on infrastructure. European transport networks should, therefore, be planned so as to enable the spreading of socio-economic benefits in an equitable manner through Europe, taking into consideration regions which are located in-between future transport corridors.

Transport networks in the countries of southern Europe should provide for continuity, by building missing links, and compatibility with respect to the rest of European networks, in terms of technical specifications, operational standards and maintenance. European institutions may play a particularly important role for initiating and co-ordinating specific projects and actions in the European space.

Perceptions in relation to the role of future transport links throughout Europe in the 21st century need to be expanded. Traditional patterns of transport networks for linking each southern European country with the economic centres of the North-West, should be enriched by upgrading the significance of links between all southern European countries and links with North Africa and the Middle East. The development of these links will enable Southern Europe to evolve from a peripheral region into a region connecting the whole of Europe with enormously significant neighbouring regions.

Southern European countries will benefit from the intensification of sea-born transport throughout the Mediterranean basin and beyond. The development and upgrading of all related infrastructure will have a critical contribution for achieving strategic objectives, which are relevant to Europe as a whole. It will facilitate European cohesion by increasing the share of Southern Europe in trading with the rest of the world. Central and eastern European countries

will gain from the integration of trans-european terrestrial transport networks with a comprehensive and efficient system of sea-transport infrastructure along the Mediterranean coast. Sea transport will promote more active economic relations between the north and the south coast of the basin, with long-term advantages for both regions. Finally, sea-transport may provide the missing links for a comprehensive transport system throughout Southern Europe, resolving network discontinuities in an efficient, economically viable and environmentally sustainable manner.

Despite the extreme value and sensitivity of the Mediterranean environment, overall development during the last decades has imposed considerable stresses on coastal area, the marine environment and urban centres. Future transport infrastructure should not add to the deterioration of environmental conditions but rather contribute towards the promotion of sustainable development. In order to achieve this objective it is essential that new transport networks should be sustainable and respect the integrity of the Mediterranean environment.

3.4. The future of rural areas and agricultural activities in Mediterranean countries

Although, as in other regions of the world, agriculture in the Mediterranean countries of southern Europe forms a declining part of the overall GDP of the area, it is still one of the most important fields of activity in the Mediterranean.

Modern Mediterranean agriculture is characterised, on the one hand, by the intensification of farming on the plains, where there is most scope to adapt to the common agricultural policy, and, on the other hand, by the abandonment of farms in the mountains and hills.

The Mediterranean is a fragile region with limited water and soil resources and there is a danger that the loss of farming land could jeopardise food security and slow rural development in the region.

Intensive farming techniques necessarily entail high water consumption levels (about 75% of water resources in the region are used for irrigation) and also increasing use of nitrates and pesticides, leading to a deterioration of the quality of the water underground and in the Mediterranean.

Mediterranean countries should be aiming to strike a better balance between agricultural products destined for local use and those destined for export, improve the quality of agricultural products and reduce divisive competition between Mediterranean farmers; there should also be a reform of the present system of allocation of price support funds, making a distinction between funds aimed at providing income support and those relating to restructuring and conversion.

The rural areas of the Mediterranean coastline depend upon the ability to protect the assets which enable these areas to promote tourism whilst also preserving agriculture, which not only has a crucial part to play in the economy but also has a vital social role. There is an urgent need to formulate an overall, sustainable policy involving all the local partners; this is crucial for the future of these especially sensitive and fragile areas.

Agricultural policy in the Mediterranean states is inextricably linked with water management; universal standards for water distribution to various sectors of activity must be set and an

overall water costing policy should be formulated at least within each Mediterranean state.

In the European Union context, the common agricultural policy should improve access for Mediterranean agricultural goods to the European Union market, bearing in mind that agricultural produce is one of the major factors in the economic growth of these countries. The expansion of Europe towards the east will probably bring an increase in competitivity in the agricultural market at European level and result in the greater standardisation of agriculture in European states. The European countries of the Mediterranean will probably have substantial problems adapting their farming techniques to these standards, especially bearing in mind that these countries will be faced at the same time with increasing competition from Mediterranean third countries and the major agricultural countries of eastern Europe.

It is also essential to finance exchanges of technology and experience and propagate agricultural methods which make it possible to improve product quality and make farms more profitable.

In its own interest, Europe should demonstrate more of a sense of solidarity towards the European countries of the Mediterranean so as to help them to become more integrated into Europe and reduce the differences which still exist between them.

III. RATIONAL MANAGEMENT OF FRESHWATER RESOURCES AS PART OF A EUROPE-WIDE POLICY OF SUSTAINABLE DEVELOPMENT

1. Water, a strategic concern for Europe

Water is the staff of life, the most plentiful resource on earth as it covers some 71% of the planet's surface. It is nevertheless a vulnerable resource, to be regarded as a common heritage and universally valved at its true worth. Its protection, and also its use as a vital resource for all development, must preserve natural balance as well as the general interests not only of the populations now dwelling on the planet but also of future generations.

Irreversible impairment of water quality would be destructive to human life and to the other life-forms depending on water.

Water requirements are increasing very rapidly with world population growth, economic development and improvement in standards of living. Irrigation now consumes approximately 70% of available resources worldwide, industry about 20% and household use just 6%. Hardly any region in the world is unaffected by deterioration of water quality and/or pollution of surface water and groundwater. A combination of factors is responsible for this situation.

The life-supporting value of water has become a major economic interest and consequently a national and international policy matter.

As long ago as 1968 when the European Water Charter was adopted, the Committee of Ministers asserted the need to frame and pursue a European water policy. More recently, the Parliamentary Assembly of the Council of Europe has repeatedly called for the introduction of a pan-European policy to safeguard and manage fresh water resources.

Thus rational management of fresh water resources is henceforth recognised as a priority action area even in Europe, since all mankind's quality of life and sustainable development closely depend on the availability of this natural resource.

Responsible management of water resources must be considered strictly according to a sustainable, comprehensive approach embracing all sectors of consumption and placed in the context of the natural basin rather than one of administrative or political boundaries.

Water knows no borders; its use as a common resource accordingly requires active international co-operation to guard against conflicts of interest between users in different states. International co-operation is expedient not only for the possible allocation of water resources but also as the way to an international consensus on national or local initiatives to protect them, since the countries applying such measures may be placed in an unfavourable competitive position compared to those with less stringent rules.

Aware that water resources, even in countries where they are plentiful, can no longer be regarded as a free and limitless commodity, several states have introduced strategies for sustainable management of this precious asset. An effort is being made to reduce wastage, prevent irreversible deterioration and recycle the vast quantities of water used daily in Europe, while avoiding ill-effects on industrial development, agri-foodstuffs and energy production, river transport, and tourist and recreation policy.

It rests with the governments to define a framework of binding general standards providing for rational and sustainable exploitation of fresh water resources, and to take care that it is duly considered whenever and at whatever level spatial planning or social and economic development programmes are devised.

The strategies being implemented in five major European regions to preserve fresh water resources and at the same time ensure adequate quantity and quality of supply to all users are succinctly presented below.

2. Strategies for the sustainable management of freshwater resources in major European regions

2.1. Strategies for the sustainable management of freshwater resources in the states of northern Europe

2.1.1. Presentation of the area

Northern Europe as defined for this reporting, includes the Nordic countries (Denmark, Finland, Norway, Sweden), the Baltic countries (Estonia, Latvia, Lithuania), Poland, northern Germany and a western part of Russia (Karelia, Kola peninsula, St. Petersburg and Leningrad regions). The nature varies a lot in characters from south to north, and the area is not one homogenous and harmonious unit. There is, however, one common feature for this area: the Baltic Sea, the largest semienclosed brackish water body in the world. All actions done in its large catchment area have effect on it. Over 100 million people live in these countries and regions surrounding the Baltic Sea. Many of the countries are quite heavily industrialised and carry out intensive agriculture and forestry on large areas, which have had effects both on the state of the Baltic Sea and the freshwater resources in the area.

SPECIAL FEATURES OF THE REGION AND THE WATER RESOURCES

– low population density in the northern part of the area;
– sensitivity to acidity (Sweden, Norway, Finland);
– great number of lakes in north-western Russia, Finland, Sweden and Norway;
– nearly half of lakes larger than 100 km2 in the EU countries are in Finland;
– big reservoirs serving waterpower (North Finland and Norway);
– in the northern part of the area most lakes are oligotrophic but rich in humus;
– the great amount of peatlands and mires in the northern part;
– not many big rivers, lots of medium size (Sweden, Finland);
– some countries drained only by a few river systems (Vistulu and Oder, Poland);
– some major and many smaller watersystems shared between countries;
– precipitation ranges from the highest in Europe (Norway) to below average;
– due to low temperature the evaporation is low;
– seasonal variations in runoff are great due to snowmelting in springtime;
– lakes and rivers, as well as the Baltic Sea, are ice-covered for a long time annually; the duration and extent of icecover are of crucial importance for the ecosystem;
– especially in the northern part of the area, soil frost has a great impact on the ground as well as water infiltration and surface runoff;
– coastal uplift and landrising in the Baltic Sea create new habitats; coastal upheaval areas and wetlands, like glo-lakes are unique from the global point of view.

Waters and shores are mainly privately owned in the Nordic countries and so is water power in Finland. This is of great importance for the use and management of waters and shores, specially in relation to utilisation of water power and to nature protection.

2.1.2. Use of water resources, water quality

Availability of water resources in Europe is highest in the Nordic countries: six to eight times

more than in eastern, southern and western Europe. Water resources, both groundwater and surface water, watercourses, rivers, lakes and shores are used for many purposes.

MAIN USES OF WATER

– domestic and industrial use, livestock (Denmark), hydropower generation (Norway), recreational purposes (waters and shores);
– abstraction of water has decreased in Finland and Sweden during recent years, and increased in some other countries like Poland and the Baltic countries;
– the surface water is the main source for water supply in most countries, only Denmark is almost entirely dependent on groundwater sources, in Finland and Latvia the situation is fity-fifty;
– water resources are used for power production; about 75% of potential water power in Finland, Sweden and Norway has been exploited;
– watercourses and shores are important for recreation use and attract outing, camping, tourism and vacation houses.

PROBLEMS WITH QUALITY AND USE OF GROUNDWATER

– overexploitation of groundwater along the coastline of the Baltic Sea – Intrusion of salt water into groundwater;
– lowering of groundwater levels reported at least in the St. Petersburg area;
– use of manure and other fertilisers causes nitrate leaching in areas of intensive agriculture (sandy soils on top of unconsolidated, unconfined aquifers in northern Europe especially in Denmark and to a lesser degree in northern Germany, Poland and southern Sweden, Norway and western Finland);
– pollution risks caused by the use of pesticides have similar type of geographical pattern (especially parts of Denmark, Lithuania and Estonia) as the use of fertilizers;
– increased concentrations of aluminium, sulphate, hydrogen ions and nitrates are reported in groundwater in some countries, e.g. Denmark and Germany;
– urbanisation and industry cause risks in countries like Finland and Sweden, where transport infrastructure and urban development have often been located on eskers and other important groundwater sites;
– airborne acidity causes acidification of groundwater and surface waters.

THREATS ON SURFACE WATER QUALITY

– discharge of untreated domestic and industrial wastewater (countries in transition);
– excessive application of fertilisers in agriculture (all countries);
– increased levels of nitrates and pesticides caused by agriculture;
– accidental spills of harmful substances (transport, specially of toxic substances is an obvious risk);
– atmospheric emissions from industrial and commercial plants, power stations, domestic heating and transport.

Reduction of point source of aquatic discharges of traditional water pollutants has been achieved in most countries of the western and northern parts of the region as a result of implementing advanced treatment technologies and improved industrial recycling processes.

However pollution of surface waters is still a serious problem. Wastewater from point sources as well as impacts of intensive land use have caused long-lasting influences on water resources. The main impact of discharges on the inland water bodies and water bodies in the coastal zone is the eutrophication that may affect almost all water use, most water supply, fishing and recreational activities. There is a high level of nitrogen in rivers, the highest is found in Denmark, Estonia and Germany. Phosphorus levels in Europe are the lowest in the Nordic countries whereas in Poland, Estonia, Latvia and Lithuania many rivers have high phosphorus levels. Fish farming and other forms of aquaculture have contributed to eutrophication. In the Baltic countries, Poland and Germany, one of the main problems is the pollution with toxic, slowly degradable organic substances and heavy metals. Point source nutrients represent another problem. In central and eastern Europe one third of the municipal wastewater is still without any treatment. Poor-quality drinking water cause human health problems in some countries.

MEDIUM-TERM DEVELOPMENTS

Most important concerning the quality of waters is the implementation of the Baltic Sea Joint Comprehensive Environmental Action Programme of Helcom (Helsinki Commission – Baltic Marine Environment Protection Commission). This JCP programme which covers the whole drainage area, has verified 132 (now 122) “hot spots”. Half of them are inland and in most cases the problems relate to municipal and industrial wastewaters and lack of treatment. Special attention should be given to water supply and the treatment of waste water in St. Petersburg, Pskov and Kaliningrad areas, and in the Vistula and Oder river basins.

In the countries in transition, immediate expenditure priorities should address short- and long-term concerns which have been considered in Environmental Action Programme for central and eastern Europe, CEE (Sofia, 1993); the priorities are to:

– invest in facilities to pretreat the wastewater discharged by small and medium sized industrial plants;
– facilitate the installation of domestic septic tanks and the appropriate disposal of manure from intensive livestock operations in rural areas;
– install municipal wastewater treatment plants in towns and cities close to important tourist or wildlife areas, especially on the Baltic Sea coasts;
– complete partially constructed wastewater treatment plants.

Special efforts will be required concerning diffuse sources, which are more difficult to control than industrial sources or municipal sewage. In rural areas, public education and proper legislation have an important role. In the countries in transition the private sector should play a stronger part in water supply and sewerage.

2.1.3. Aquatic environment: threats and needs for actions

In the boreal region of northern Europe rivers and lakes are environmentally in a relatively good condition. In some Baltic countries the situation is worse. In Denmark there are no river reaches in natural condition. Many of the most important rivers in the area are regulated; however, many rivers are still in natural condition, 70-100% e.g. in Poland and Norway. In the Nordic countries harnessing of new water power is in many watercourses prohibited and parts of the watercourses, still in natural state, are protected.

The biodiversity related to freshwaters and wetlands is high in this region and the amount of threatened species is generally lower than in central parts of Europe.

THREATS TO NATURE AND WILDLIFE

- hydropower production has meant major intrusions upon the natural environment;
- water construction, especially dams: changes in food chains and migratory patterns of fish species;
- regulation of waterlevel and waterflows: changes in river hydrological processes and ecological conditions, erosion;
- drainage, land reclamation and peat extraction;
- water pollution, eutrophication (agriculture, fish farming, point source) and acidification (atmospheric sources and upstream drainage);
- the stocks of natural Baltic salmon and trout, a valued genetic resource, is being impoverished by environmental pollutants and over-fishing;
- land use on shorelines, cultivation, building of houses;
- burning of oil shale in Estonia and nickel mines in the Kola region;
- former Soviet Union military sites are environmental risk areas.

Acidification of waters largely caused by long-range emissions has become a serious water quality problem. The Fennoscandian shield offers less protection than the readily weatherable sedimentary rocks on the continent. Fish mortality has been observed in rivers and lakes, in southern Norway 1750 lakes are completely devoid of fish as a result of acidification, about 900 lakes besides are seriously affected, and the Atlantic salmon is extinct in 25 rivers due to acidification. In Sweden damage has occurred in 2 500 lakes.

Reindeers may cause some threats to the environment in the north-east part of the area. In recent years, the number of reindeers has grown, and overgrazing can result in soil erosion and water pollution.

A significant proportion of the radioactive caesium that descended on southern Finland and central Scandinavia as a result of the Chernobyl accident was eventually taken up by lake fauna. It may last several decades until the lakes will recover.

One of the most important, yet most threatened rare habitat types common to all European Union countries are the wetlands: marshes, fens, peatlands, or shallow water bodies.

MEDIUM-TERM DEVELOPMENTS

Conclusions and recommendations of the EU's concept for Wise Use and Conservation of Wetlands should be implemented: a comprehensive strong wetland policy should be set up and the objectives should be included in the European Spatial Development Perspective.

Recommendations for river ecosystems and wetlands in EU's Strategic Action Plan 1996-2000 should be implemented. According to Action Themes 6 and 7 countries should: increase awareness of traditionally managed riverine landscapes; conserve the very few major natural and semi-natural rivers (e.g. remaining wild rivers in the Nordic region); promote species reintroduction and habitat restoration; initiate awareness campaigns of the least damaged

Scandinavian and CEE rivers; create guidelines for the restoration and rehabilitation; ensure that conservation objectives are incorporated into policies affecting wetlands; establish conservation action plans for threatened wetlands e.g. boreal raised bogs (Aapa, Palsa) in the Baltic and Nordic regions; assess the conservation importance of peat bogs.

EU's Habitats Directive should still be completed with boreal freshwater and coastal habitats. Freshwater habitats to be added could be: north boreal clear water lakes, boreal- and hemiboreal large oligo- or oligomesotrophic lakes, natural or near natural river systems and small lakes naturally without fish. Coastal boreal baltic habitats to be added could be: esker islands, undisturbed islets and small islands, coastal meadows, sand beaches with perennial vegetation and long narrow inlets. Also some species should be added, e.g. ringed seal and black guillemot.

The need for restoration of water bodies should be investigated and implementation of restoration projects should be promoted. Watercourses should be restored when earlier uses have ended (e.g. timber-floating or water power production). Previous spawning rivers of sea salmon should be improved. Fish steps should be built for migratory fish in connection to water constructions. Constructions having cultural or historical values could be spared, for example water mills and timber-floating equipments.

2.1.4. Research, monitoring and data systems

The freshwater monitoring programmes are varied in different countries. All countries have their own national or regional networks, but also international networks such as the EU River Network, UNEP/GEMS and in very near future also the EEA network are used. Many countries have a long research tradition in water resources assessment including the influence of human activity on the quantity and quality of the fresh water resources. Effects of forest wetland drainage have been studied in Finland over fifty years. In Germany research addressing land use change and its effects on water resources has become more important over the last decade. Several institutions are working within this field.

MEDIUM-TERM DEVELOPMENT

Groundwater processes are important ecological functions. However, systematic inventory of human-induced lowering of groundwater levels and other changes in groundwater systems is not available. Effects on the groundwater ecosystem are still largely unknown. Regular systematic monitoring of the groundwater is needed.

Climatic changes may have the following effects on water resources in northern Europe: considerably warmer winters and a moderate warming in other seasons, an increase in annual precipitation, smaller spring floods, increased floods in winter, shorter ice cover periods and higher summer temperatures in lakes, enhanced leaching of nutrients from agricultural lands in winter. The influence of these phenomena on water resources and their use must be solved.

The main priority for research is to develop hydrological models which can be linked in with both climatological models and land use databases. Models should allow prediction of effects of climatic change both in spatial and temporal dimensions. There is also a need to improve the predictability of water resources availability under different climatic change scenarios.

The efficient use of the environmental data requires that data is stored in a way which enables the use of it for different purposes by different users. To ensure that data collected by different organisations in different areas would be comparable in future, strict standardisation and co-operation is needed.

Environmental information systems should be expanded because the coverage of some variables for measuring water quality is in many countries limited.

More objective, reliable and comparable information by means of a sound monitoring system is needed for implementation and improvement of environmental policy. Public awareness in environmental matters should be increased also by e.g. popular and semiscientific publications and booklets.

2.1.5. International co-operation

The Helsinki Commission (Helcom) is an over twenty years old intergovernmental organisation with the task to protect the Baltic Sea from all kind of pollution. To assure the ecological restoration of the Baltic Sea and its catchment area, the Joint Comprehensive Environmental Action Programme (JCP) was developed for the years 1993-2012. Key principles of this are: recognise the importance of a long-term perspective for ecological restoration, harmonise economic and environmental objectives, control pollution at the source, establish conditions for private sector participation.

Vasab (Vision and Strategies around the Baltic Sea) is a co-operation process of the Baltic sea countries and regions (including also Norway, Belarus and Karelian republic of the Federation of Russia) in the field of spatial planning. The ministers of the states and regions around the Baltic Sea agreed there to launch a joint spatial planning process to formulate goals for spatial development in the Baltic Sea Region, strategies how to achieve these and first common actions to start implementation. The first common report called Vision and Strategies around the Baltic Sea 2010 – Towards a Framework of Spatial Development in the Baltic Sea Region, was produced for the third conference of ministers for spatial planning and development in 1994.

MEDIUM-TERM DEVELOPMENT

The implementation of the Baltic Sea Joint Comprehensive Environmental Action Programme (JCP) needs substantial back-up by the western participants to the central and eastern European countries, primarily by improving the environmental situation at the hot spots. HELCOM and EU should act as partners in this work. The Baltic Sea with its catchment area should get special attention in the regional programmes of EU. The main issues of the JCP programme for the Baltic Sea and its catchment area are:

– establishment of requisite legal and institutional infrastructure;
– further reducing of point and non-point source pollution;
– reduction of pollution from agriculture and rural settlements as well as transport.

Co-operation is needed especially in cases where the major catchment areas of water systems are divided by two or more countries.

Energy production, distribution and consumption represent a major source of environmental, also water connected problems such as acidification, climate chance and high concentrations of low-level ozone.

2.1.6. Transboundary waters: use and problems

In northern Europe there are a lot of watercourses which are divided between two or even four countries. Poland e.g. has twenty-four transboundary rivers and one lake, and between Finland and Russia there are tens of frontier lakes and rivers. Most transboundary waterbodies are used for fishery, agricultural and industrial purposes. Power generation and supply of drinking water are important in several rivers. In the Baltic countries transboundary rivers and lakes have special importance for water supply. Northern watercourses are important for aquatic wildlife, recreation and fishery.

PROBLEMS AND THREATS

River Narva and Lake Peipsi on the Estonian-Russian border have been threatened in the past by accidents in the oil-shale mines and industries.

Tenojoki river, the boundary river of Finland and Norway, is the most important salmon river in Northern Europe. The indigenous salmon population is essential for the reproduction of the Atlantic salmon. Acidification may be a serious threat to the valuable salmon population.

MEDIUM-TERM DEVELOPMENT

ECE (Economic Commission for Europe) Convention on the protection and use of transboundary watercourses and international lakes is the most relevant agreement regulating access to and use of the shared resources.

For joint transboundary water resources riparian states should formulate water resources strategies, and prepare and harmonise water resource action programmes.

The ministerial Conference in Sofia 1995 also noticed the need of integrated and sustainable management, in particular in transboundary waters, and recommended: promoting water demand management, setting up information systems for reliable data, agreements for restoration of transboundary aquatic ecosystems, establishing programmes for assessing quality and quantity, and monitoring pollution. These recommendations should be implemented in cooperation with respective countries and regions.

2.1.7. Integrated water resources development

There is a need for a holistic management of freshwaters as a finite and vulnerable resource, and the integration of sectoral water plans. The natural unit for water management, rational utilisation, protection, conservation and management is the catchment area.

Planning for individual watercourses is necessary to identify conflicting interests and possible collaboration and to draft solutions as part of local water management and physical planning.

An example of comprehensive planning of water resources are regional integrated development plans for water use and protection, covering the whole of Finland, made in the 1970s and 1980s by authorities, municipalities, organisations and interest groups on the planning areas. Those plans included water quality; water supply; fisheries; water transportation; water conservation; waste water problems; flow regulation; nature conservation; water landscape; recreational uses as fishing, boating, canoeing, vacation residences and water-oriented tourism. More detailed plans for important individual watercourses have been made later in the 1990s.

MEDIUM-TERM DEVELOPMENT

Better integrated water management is needed to halt and reverse deterioration of waters. It is important to ensure that effects on aquatic environment are included in water use planning and decision-making process. A catchment management agency could be an useful tool.

UN water Conference in Mar del Plata in 1977 already took note of the need for integrated water management and ECE gave in 1990 recommendations concerning optimal water management of small catchments.

Developing a common tool for the integrated management of water resources and land use should involve assessment of vulnerability, hazards and demand within a catchment so as to define appropriate land uses. A multi-disciplinary approach should be adopted to ensure a coverage of environmental, economical and social interests and effects as comprehensive as possible.

One of the basic elements in the proposed new EU water policy is the setting up of integrated programmes for drainage basins. The programmes should cover all significant activities affecting the status of surface- or groundwaters. This approach to integrated water management should be promoted and transported also to physical planning.

2.1.8. Co-ordination of water use and protection with physical planning

The importance of land use planning for water management and protection has been recognised in all Nordic countries. Different types of restrictions on land use to protect both groundwater and surface water resources have been imposed in all countries, but conflicts between the existing land use and sustainable water management continue to occur.

Water resources and coastal areas have been an important issue in physical planning in Sweden at country level (management of land and waters) and at municipality level (water overviews into land use plans). Protection needs concerning water resources have been included in regional zoning plans in Denmark. Ground and surface waters to be protected are pointed out in regional land use plans in Finland. The Finnish authorities elaborated a project for evaluating how land use management can support water pollution control through different forms of land use planning (from regional land use plans to detailed planning). In Sweden there is an integrated approach to land use planning and water planning.

Apart from the immediate impacts, the land use patterns play also indirectly a very significant role in relation to the quality of water resources. The sources of airborne acidity which causes acidification of the water resources especially in the Nordic countries are to a great extent in heavy industry and urban areas of western and central Europe. One serious challenge lies in the countries in transition, where the private car ownership is rising rapidly and the control of urban development is perhaps not yet adequate to face the privatisation process.

MEDIUM-TERM DEVELOPMENT

Spatial planning is an essential tool of sustainable water management. Co-operation between spatial planning and management of water resources should be intensified at all levels. Close co-operation between VASAB (Vision and Strategics around the Baltic Sea), HELCOM (Helsinki Commission) and the EU as well between regions and subregions should be developed.

From the viewpoint of water management Vasab 2010 process has created a framework for international spatial planning co-operation, which is needed especially in cases where the major catchment areas or water systems are divided between countries. By the means of supranational spatial planning it is possible to develop land use in a coordinated way and build up a shared responsibility to the common water resources.

Important issues in spatial planning concerning water resources are:

- careful selection of sites for activities which may cause risks for groundwater resources or aquatic environment including landscape;
- taking water as an essential element into town planning, a wise use of runoff in urban areas;
- careful planning of inland watertransport systems;

– integration of the water management to land use planning in relation to infrastructure development, thus avoiding urban sprawl and unnecessary growth of transport.

2.1.9. Means and measures for sustainable use of water resources

Qualified legislation concerning water use and water protection has been in force for a long time in the Nordic countries, and there have been good institutional conditions for sustainable management of waters. A water legislation existed already in the 1800s in Sweden and Finland. The laws concerning pollution and environmental protection came in the 1960s. In the Baltic countries in transition the situation has been worse and they are now taking the first steps in developing legislation and adapting it in practice. Countries of the CEE region are in diverse levels of legal development.

The successful implementation of the Baltic action programme will require a long-term political commitment in the Baltic Sea region, which, in turn, requires a solid base of public support. This is especially important as the major part of the burden for financing will, ultimately, rest with the domestic financial resources and be borne by the public either directly through user charges or, possibly, indirectly through increased costs for goods and services.

The Ministerial Declaration of 1990 encouraged human contacts in the region and participation of local governments, private institutions, industries and non-governmental organisations on increased environmental cooperation in the Baltic Sea area. People living within the area need to become more aware of values, problems and emerging threats on the area.

Taxation should be applied to make the users of the environment responsible for the ecological costs they cause. Increasing the responsibilities of local governments for environmental management is an important factor also in improving sustainable water management.

MEDIUM-TERM DEVELOPMENT

The purpose of the work with public awareness and environmental education is to develop a broad and more sustainable basis of support from the public for the implementation of water protection tasks. Participation of NGOs (non-governmental organisations) and development of effective, formal and informal environmental education programmes will be important to support both public awareness and political commitment. The NGO is an important catalyst for many projects in the countries. All support from administration should be given to them.

Environmental Impact Assessment (EIA) should be further developed and used with all planning activities, specially in connection with important water resources and sensitive areas. The ECE Convention on Environmental Impact Assessment in a Transboundary Context (Espoo 1991) is a good starting point. In the countries in transition EIA is not a real procedural element of environmental decision-making. The connection of EIA to permitting is not always clear.

There are problems of access to information in member states of the European Union and, even more, of public participation – the question concerning the lack of rights in this field is even more crucial. In many cases a problem is also that only professional and scientific associations participate in EIA. Better transmission of data is needed. EU's EIA directive should thus be developed to strengthen the early public participation in the procedure.

The implementation of education on new farming practices is critical. A major public education challenge exists on the issue of nitrate contamination of ground water. The general public needs to be reminded of the facts.

2.1.10. Main actions needed for the water sector in Northern Europe

Water resources should be taken into account at all levels and in all development of human settlements, industry, energy, forestry and agriculture. That requires adequate knowledge, public awareness and political commitment.

PROTECTING GROUNDWATER

The quality of groundwater should be protected everywhere by developing legislation, economical instruments and education.

Subregional and national inventories of groundwater resources should be made as soon as possible.

Zones to protect aquifers against pollution from agriculture, industry, traffic and settlements should be established.

PROTECTING AQUATIC ECOSYSTEMS

Natural water bodies and wetlands rich in biodiversity should be preserved e.g. by creating a coherent network of valuable sites.

Maintenance of biodiversity should be integrated into all watercourse management and land use.

Heavily polluted aquatic environments should be rehabilitated.

Rivers, lakes and wetlands should be restored to good ecological status, suitable for fish and for recreational uses.

Protection measures should be adapted taking into account special features e.g. sensitivity to acid rain and severe climate conditions.

WASTE WATER TREATMENT

Decisions and recommendations of regional and subregional, intergovernmental organisations (e.g. Helcom, UN/ECE) concerning industrial and municipal discharges should be fully implemented.

Treatment methods for sewage from sparsely populated settlements and small communities should be improved and developed to promote sustainable development.

REDUCTION OF POLLUTION FROM DIFFUSE SOURCES

Measures should be taken particularly to reduce discharge of nutrients and other harmful substances e.g. biosides into the aquatic environment.

Environmentally sound practice in agriculture and forestry should be applied.

Protection zones and strips should be established along watercourses.

Local and regional environmental management plans should be prepared.

MONITORING AND APPLIED RESEARCH

National hydrological and limnological networks as well as monitoring of waste water loading should be checked to guarantee harmonised data production in all countries concerned.

More reliable and comparable data concerning the causalities between different loading and stressing activities and the state and usability of water resources is needed.

DATA TRANSPARENCY AND PUBLIC AWARENESS

Comprehensive reports on the state of the environment should be prepared.

Harmonisation and transmission of data should be developed.

Access to environmental information and data transmission should be guaranteed in all countries.

Education, training and public participation e.g. in non-governmental organisations should be promoted.

INTEGRATED WATER MANAGEMENT

Integrated water resources planning should be developed and applied on catchment base and transposed into physical planning.

Special administrative tools for co-operation should be developed in cases, where catchment areas are divided.

WATER RESOURCES AND SPATIAL PLANNING

Environmental impacts should be taken into account in all development projects (traffic, energy, agriculture, urban infrastructure, etc.) and prevention of harmful effects of these projects should be ensured as far as possible.

Damages caused by water and ice as well as flood control and river maintenance, should be taken into consideration in all land use planning.

Land use of the entire catchment area should be planned in a co-ordinated way.

Sustainable use of local and regional water resources should be ensured by planning the location of human activities so that the demand of water does not exceed the replenishment rate of surface and ground water resources.

Adequate restrictions on land use should be imposed concerning activities, which may threaten the quality of valuable surface water or ground water deposits.

Public participation in planning of development projects should be promoted.

2.2. Strategies for the sustainable management of freshwater resources in the Rhine basin

2.2.1. Preface

A series of strategic principles for sustainable and environmentally compatible management of water supplies was formulated in the wake of the World Climate Summit in Rio de Janeiro. These principles may be summed up as follows:

– an integrated approach towards water supply, sewage treatment and protection of surface and ground water is called for;

– the sustainable handling of water must build on the principles of integrated water management: water is a major constituent of the ecosystems as well as a social and economic resource. Sustainable water management must be related to environmental protection and nature conservation, public health and epidemic prevention, land-development programmes and industrial politics;

– this form of water management calls for regional implementation; one potential regional area is the river basin. Local communities in the respective region must be allowed to participate in all stages of sustainable water management. All social strata and both sexes should be specifically approached on the subject.

2.2.2. Point of departure in the Rhine basin

Almost 20 million people in the Netherlands and western Germany are supplied with drinking water from the Rhine and its tributaries. The Rhine and Lake Constance along with its tributaries, Ruhr and Main, constitute the backbone of the supply of drinking water and of industrial water[1] in particular. The waste from industry and private households ends up in the river again – in some cases after being treated; on the way to the North Sea, each water molecule of the Rhine is subjected to multiple human utilisation.

Large stretches of the Rhine and its tributaries are canalised shipping channels; embankments and weirs hamper its course. This had led to the collapse of ecosystems in rivers, river-banks and wetlands, made worse by contamination from sewage discharge.

The politics originating at European Union level and in countries through which the Rhine flows have so far been oriented towards water quality. The national (federal) directives focus

1. Water from the Rhine is increasingly being used in industrialised agriculture.

mainly on waste discharge from sewage works and similar point sources; as such they are emission-oriented. The ensuing statutory measures together with voluntary agreements[2] led to the minimisation of (industrial) sewage constituents, particularly oxygen-consuming ones and halogenated organic compounds. In addition to this, the European Union directives for the prevention of water pollution also emphasise emission; in this context, attention should also be drawn to the water quality targets of the International Commission for the Protection of the Rhine, the first instance to take into account the idea of integrated water management. Nevertheless, it must be said that appropriate instruments for applying this emission-conscious logic are not yet available; in Germany, Directive EWG/91/676, designed to restrict levels of agricultural residue into rivers, lakes and ground waters has not yet been put into practice.

2.2.3. Mid-term trends: exacerbation of problems

WATER SHORTAGE

The abundance of water in the Rhine basin is declining as a result of anthropogenic intervention:

– agricultural land is drained by drainage pipes, as are industrial and residential areas. Water is often drained off the countryside by sewers functioning as drainage pipes;

– the capacity for water retention is reduced by deforestation and earth compaction, the risk of flooding is increasing;

– in the lignite-mining area on the left bank of the Rhine in Germany, the static ground-water supply is being pumped away entirely leading to a lowering in the ground-water table over thousands of square kilometres as far as Belgium and the Netherlands. This state of disorder will continue for centuries after the mining of lignite has ceased. Similar problems also exist to a lesser degree in hard-coal mining areas (Ruhr-Emscher-Lippe-Saar -Moselle);

– in some parts of the Rhine basin (e.g. Hessisches Ried between Frankfurt and Mannheim), supplies of ground water are so over-exploited that it is causing damage to ecosystems on the surface as well as to buildings.

DESPITE PARTIAL SUCCESSES IN WATER PROTECTION POLICIES, THE POLLUTION OF RESOURCES GOES ON:

– less than 50% of organic solvents in Rhine water degrade during their passage along the bottom of the river into the communicating aquifers. Extremely low degradation rates have been determined for long-life substances which means that they contaminate these resources. This presents the water authorities with a problem which they have little hope of solving. Problematic substances which do not degrade, even in the sewage-treatment plants, are: predominantly pharmaceuticals and their metabolites from domestic sewage; sulfonated aromatic substances and secondary amines from sewage resulting from the production of dye-stuffs, plasticisers, ion exchangers, pharmaceuticals; pesticides from

2. These are largely the result of initiatives on the part of the Rhine water works and the city of Rotterdam (harbour sludge).

the run-off of fields and domestic drainage are also likely to penetrate.

– the potash lye discharged into the Rhine from the French potash industry is currently responsible for the river's considerable salinisation. In future, larger quantities of saline effluents will enter the rivers from the municipal sewage works (chemical phosphate precipitation). For this reason it is probable that the ground-water reservoirs communicating with the river will continue to become over-salinated. Agricultural employment of overhand irrigation[3] and particularly the artificial infiltration methods practised by some water boards contributes to the over-salinisation of major ground-water reservoirs in the Rhine basin (e.g. Hessisches Ried).

– some pathogens and other microbes from purified and non-purified domestic sewage systems may enter the ground-water reservoirs communicating with the river, thus leading to long-term contamination.

THERE IS INCREASING FUSION OF QUALITY AND QUANTITY PROBLEMS

– in the Rhine Basin, the utilisation of quaternary or even older ground-water reservoirs leads to salt water rising into the aquifers; over-salinisation renders the resources unusable.

– a consequence of utilising deeper ground waters in the lowland of the Upper Rhine is that dirt from aquifers close to the surface become drawn into the static resource.

IF THE CURRENT TECHNOLOGY FOR CLEANING DRINKING WATER CONTINUES ON ITS PRESENT COURSE, THIS "WILL IMPLY A TERRIBLE BURDEN FOR FUTURE WATER PURIFICATION" (BERNHARDT & SCHMIDT 1988: 99)

– if levels of river pollution remain as high as they are today, river-bank filtration will prove to be a non-sustainable procedure: enduring pollution can mean a partial collapse of the ground passage, i.e. penetration by heavy metals, bacteria and viruses, polar organic solvents and other hazardous substances and contaminants from the bank into the utilised aquifer.

– the purification procedures which precede artificial infiltration of river water into aquifers can reduce the concentration of contaminants, hazardous and intrusive substances by between 50 and 95%; nevertheless, even this residual content can rule out the aquifers as a source of drinking water for future generations, due to the excessive strain on the infiltration body and pollution of ground-water resources.

– the employment of exclusively technical procedures for water purification is no solution in terms of sustainable resource management: purification of freshwater for direct use as drinking water (customary in France and Great Britain for instance) is

3. The use of Rhine water for overhead irrigation leads to over-salinisation of the ground in the long term.

even more energy-intensive than the purification carried out prior to artificial enrichment of ground water; in addition, the precipitations used today call for non-renewable resources. Some of the resultant sludges merit the label hazardous waste.

2.2.4. Long-term trends: extreme exacerbation of problems

If not dealt with in a focused and concentrated fashion, the mid-term trends will, in the long term, come to a head and are later unlikely to respond to constructive troubleshooting within a rational political process. The predicted changes to global climate could well mean that problems of water shortage and water quality will combine with each other and build up to a degree hitherto unknown:

– the global change will conceivably lead to a rise in temperature of 1.5°-4.5°; as a result, the glaciers in the Alps will melt by almost 50% within thirty years and melt almost entirely within a century: during the summers in particular the quantity of water in the Rhine will be substantially depleted; the cooling capacity of the river water will no longer suffice for energy generation and industrial production, inevitably leading to increased shut-downs of power stations and production plants (or to the tapping of groundwater for cooling purposes);

– due to the change in global climate it is possible that cases of extreme flooding will become more common;

– bearing in mind the reduced quantity of water in the Rhine as a result of glacial melting, if effluents continue to be discharged into the Rhine at the present rate this will lead to problems with quality which will be absolutely insupportable for the water supply, ecology and fisheries.

If water utilisation carries on according to today's pattern, the purification of water from the Rhine Valley for drinking and also for industrial water purposes will have to be radically stepped up, above all in the Lower Rhine area (Netherlands, North Rhine Westphalia). The resulting price increases for drinking water on the one hand and for the stricter measures required in order to purify the water on the other will be immense. In future it is conceivable even for Europe that not everybody will still be able to afford the cost of basic water consumption.

2.2.5. Proposed reform strategy

Fundamental reform is necessary in order to insure that contaminants and hazardous substances do not shift from river water to the ground waters at the expense of future generations: the freshwater supplies of the Rhine Basin need to be treated with consideration for their ecological context and usage so that all potential modes of usage are guaranteed (or might be re-established). However, an integration of water production, sewage treatment and water protection alone is not enough. A change in the consumer's approach to water is also imperative; up until now there have been hardly any statutory specifications to control the various users' handling of water.

Every form of water utilisation should (like water extraction and sewage treatment) be based on the principles of integrated water management. From the integrated perspective, however, taxing water utilisation is hardly likely to bring about the far-reaching changes in behaviour that are required.[4] In addition to this, there must also be a change in the political orientation of water management, and the technical water infrastructure (long-distance pipes, municipal networks, treatment plants) must also be modified in part.

An ecological urban research financed by the German Ministry for Education and Research was able to show that water suppliers, water users and sewage institutions would be quite capable of adapting to a new, sustainability-oriented role model in water policy. The infrastructural reform that it proposes is outlined in "Construction and networking of decentralised cycles" (Schramm *et al*, 1994). This could gradually replace today's handling of water. Although bringing short-to mid-term relief to existing problem areas, the reform to water management policy will take one or two generations to complete.

Maxims need to be developed for industrial and private water utilisation and for management of the resultant sewage, in accordance with the role model "Construction and networking of decentralised cycles"; with the help of consulting, public relations campaigns and social arrangements, such maxims presumably stand a greater chance of affecting behaviour than taxation. Contrary to taxation, they can take into account seasonal fluctuation and extreme situations (e.g. a series of dry years). The pre-condition is that regional and communal water planning also underpins the reform process. For example, planning should no longer aim at the technical expansion of supply until it satisfies the predicted maximum demand, as has been the case in the past.

It is far more important to achieve a change in the existing pattern of water utilisation via demand-side management of the water companies and new policy-making water institutions (analogous, for example, to the energy agencies of some Federal German states). In addition, the infrastructures of water supply and sewage discharge need modifying; with regard to the commercial sector, localised dual water systems save drinking water.[5] If, in addition, other patterns of water utilisation could be implemented for water and sewage management both in the commercial and household sectors (e.g. introduction of a production cycle, avoidance of persistent substances in households), then this would:

– make sewage purification far simpler and cheaper to carry out;

– represent a bonus for water ecology and

– help reduce problems in purifying drinking and industrial water in future.

For the implementation of appropriate sewage management, watery liquid waste should no longer be given statutory priority over solid waste; what is needed is a general obligation to avoid or recycle waste.

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4. The only way it could serve as a controlling instrument would be if all water users were to react similarly to monetary incentives and, in addition to this, if a common price threshold could be found which would induce all parties to act according to the intended logic.

5. For example, the air-conditioning systems and toilets of the new terminal at Frankfurt airport are fed with non drinkable water, thus slashing the airport's drinking-water requirements considerably.

Furthermore, the maxims of water supply management and water protection must be changed in such a way as to leave subsequent generations with adequate courses of action of their own: concentration on the large, and currently only economically viable resources of water (e.g. Lake Constance for a large areas of Baden-Württemberg) must be revisable. Decentralised water resources need to be exploited more intensively. In view of the problems of quantity and quality anticipated for the future, and the demands on a sustainable means of water purification, one should try and resort to waste-free and natural methods of extraction (analogous to river-bank filtration). The pre-condition for this is that the water quality again becomes absolutely safe.[6]

In order to implement appropriate restructuring not only in the Upper Rhine but also in the middle and at the lower reaches (where – because of its dependence on the water "upstream" and the damage in the brown-coal area – the predicted water shortage is likely to have far more radical effects), it is necessary to initiate a co-ordinated reform process for water policy. This leads to a strategically two-pronged movement:

– a water policy framework needs to be drawn up for the entire Rhine basin, which underpins development towards sustainable water management, e.g. with norm examples and which initiates the reform process;

– for this it is necessary to ensure that in smaller regions regional sustainability also becomes a subject for debate centring around the protection and utilisation of the respective endogenous water supplies. Responsibility must be delegated to the water users so that they function on an equal footing alongside the water management and policy-making institutions parties with valuable experience of their own to offer as input. As far as the smaller regions are concerned, the task is to give concrete form to the measures required for the Rhine basin, based on the respective specific conditions.

6. Furthermore, the natural communication between the surface water and the ground water flowing parallel to it needs to be improved upon. The way to do this is by maintaining as far as possible a natural, morphological-dynamic drainage process over a bed of pebbles and gravel with flooding and wetlands areas or via appropriate initial steps.

2.3. Strategies for the sustainable management of freshwater resources in the alpine region

2.3.1. Integrated exploitation and management of water resources

CURRENT SITUATION

Alpine water resources are effectively safeguarded and efficiently used, compared to other regions, while residents are well protected against water-related hazards. The alpine countries have an extensive legal armoury in this field and a well-developed and decentralised water-related economy, while water's incalculable value, coupled with its destructive potential, are generally recognised. This has usually resulted in the right decisions' being taken.

In recent years, the normal organic content of rivers has been drastically reduced, despite an increased inflow of sewage. This has led to a considerable improvement in water quality.

The most important renewable energy source in alpine regions is hydro-electric power. In Switzerland, for example, it accounts for 12% of energy consumption and 60% of electricity produced. The numerous hydroelectric plants and the formerly extensive quarrying of aggregates have served to increase the number of man-made water sources, which function artificially.

Conditions in the region are also favourable for drinking water. It has abundant and relatively unpolluted water resources. However, by no means all the quantitative or qualitative problems connected with water have been resolved.

Protecting the region's inhabitants against floods and other natural hazards poses a difficult problem because of the potential force of the flow in such a precipitous terrain and the density of population in certain alpine valleys.

MEDIUM-TERM DEVELOPMENTS

The main problems are those that apply to any mountain area: how to reconcile the particular features of such an environment – naturally fast flowing rivers, reduced capacity for sewage treatment in winter and the vulnerability of the water tables – with the uses to which these resources are put – hydro-electric power, winter and summer tourism, alluvial valleys in which the population is concentrated, industrial activities and transport.

New industrial substances, such as oil-based products and ones derived from inorganic chemistry, are constantly appearing on the market, and then entering the environment. Traditional measures only offer limited protection against these hazards and need to be modified accordingly. As well as protecting the quality of alpine rivers, quantitative controls, for example specifying adequate residual flows, wherever water is diverted for other purposes, will become increasingly necessary.

All the forecasts predict a rise in energy consumption. The answer appears to be a greater use of water-based power. However, such a solution should only be adopted after carefully weighing the different interests of the various users and the environmental aspects of the problem, and after first exhausting all the possibilities for economising on electricity consumption.

Water consumption in the alpine countries is not expected to rise significantly so that the available supplies of drinking water should be sufficient for future needs.

The sustainable development principle calls for new approaches to the prevention of water-based damage. Natural hazards such as floods and mud spates continue to pose problems.

OBJECTIVES

Protecting water:

– maintain the supply and quality of water at their current levels;
– maintain the ecological value of rivers and streams;
– maintain the ideals and cultural values associated with rivers and streams;
– avoid over-exploitation, and in particular maintain ground water levels, ensure adequate flows below capture points and establish favourable conditions for the development of aquatic flora and fauna.

Use:

– modernise and extend hydro-electric plant already in service.

Protection against water-based hazards:

– improve arrangements for dealing with major natural hazards. Regional planning can help to prevent, or at least, limit damage by reducing the number of risk factors. Moreover, in combating natural hazards, prevention is preferable to earth moving or restitution work, or costly protective structures.

ACTION REQUIRED

Protecting water:

– continue the integrated management of water on the basis of existing legislation;
– produce management plans for wetlands and species of national importance and protect wetlands from in-filling and urbanisation;
– produce stricter anti-pollution requirements, particularly regarding phosphorus
– take account of the host area's water resources and capacity, in terms of consumption and sewage collection and treatment, when designing or adapting major tourism facilities.

Use:

– make the public and water officials more aware of the need to cut out wastage and modernise distribution networks to reduce losses;
– continue to seek a more coherent approach to lake management through co-operation between local authorities;
– try to reduce the environmental impact of hydro-electric plant; careful transport management, modify operating requirements, particularly regarding residual flows, when permits or concessions are renewed.

Protection against water-based hazards:

– plot natural hazards on maps and introduce protective measures where there is a demonstrated need.

2.3.2. Inventory of water resources

CURRENT SITUATION

Hydrological, meteorological, glaciological, geological, biological and environmental data have been recorded systematically for many years, thus making it possible to estimate the volumes involved and monitor flows. Such information is critical for producing economically sound solutions to major problems concerning the scale and functioning of operations.

MEDIUM-TERM DEVELOPMENTS

Population growth, coupled with increased water consumption and a greater need for protection, create a requirement for more detailed and accurate data, to permit the best possible response to what are often conflicting calls and demands.

OBJECTIVES

– establish a long-term water supply and quality observation network, linked to other environmental observation networks and adapted to consumers' new requirements;
– ensure that the data is properly used.

ACTION REQUIRED

– make basic hydrological data more widely available;
– increase our knowledge of surface and ground water resources, particularly their quality, and strengthen national and international co-operation;
– extend and improve the use of the data;
– strengthen links between the hydrological and other environmental observation networks;
– increase research to improve the extrapolation of temporal and spatial parameters and produce more hydrological data on a regional basis;
– undertake research aimed at improving disaster forecasts and warnings.

2.3.3. Safeguarding water resources, quality and ecosystems

CURRENT SITUATION

As in the past, both surface and ground water are threatened by:

– noxious substances produced by households, commerce and industry;
– the infiltration and leaching of noxious substances emanating from agricultural land;
– noxious substances entering from the atmosphere;
– the accidental introduction of substances.

Lakeside locations, which are of major biological importance, are threatened by creeping urban sprawl.

MEDIUM-TERM DEVELOPMENTS

The threats referred to above can never be totally eliminated. However, steps must be taken to reduce the risks. In future, it will be increasingly necessary to avoid excessive diversions of rivers for power generation purposes, covering up natural water courses or lowering water tables. Increased protection will also be needed for wetland biotopes and the ecosystems of river banks and deltas. On all lake shores, controlling land use poses a real challenge.

OBJECTIVES

– as far as possible, stagnant waters, rivers and riverside areas influenced by water courses should include living communities, be these animal or plant species or micro-organisms, and self-reproducing and self-regulating communities in their natural state and place of origin;
– the living communities must include varieties and distributions of species typical of streams and rivers with few or no pollution deposits;
– in no circumstances should substances resulting from human activities that are likely to accumulate in living beings in undesirable concentrations be deposited in water courses;
– stretches of river that are still flowing in their natural state should be preserved;
– the polluter-pays principle should be extended;
– water should be given increased protection from agricultural activities;
– the infiltration of clean water into the sub-soil should be encouraged;
– steps should be taken at source to reduce the quantity of industrially derived synthetic organic substances and heavy metals in sewage;
– use should be made of industrial manufacturing processes that minimise environmental pollution.

ACTION REQUIRED

– avoid or reduce the introduction of products, whether from industrial or other sources, that cause damage or pollution or are likely to enter certain organisms;
– improve the state of rivers through improvements to environmentally important areas and other forms of ecological upgrading;
– sewage produced by most of the population should be treated in centralised sewage plants;
– non-polluted water should be drained off by infiltration into the sub-soil, if local conditions permit;
– in accordance with international agreements on the protection of the North Sea, sewage plants must eliminate nitrogen;
– vigorous action must be taken to make the management and running of existing plant as efficient as possible;
– where possible, sewage sludge must be used for agriculture;
– the long-term funding of sewage disposal and treatment must be guaranteed;
– residual flows that can be maintained in the long term must be established;
– controls must be exercised over lakeside land use, in terms of urban sprawl, numbers of tourists and conservation activities;
– biological links must be maintained or restored between lakes and the rivers that feed them;
– mineral aquifers must be preserved.

2.3.4. Drinking water supplies and sewage disposal

CURRENT SITUATION

In the Alps, ground water accounts for a significant proportion of the total water supply. The principal threat to the quality of ground water comes from agriculture, in particular nitrates, sulphates and pesticides to protect crops, the transport of dangerous materials, inadequately treated sewage, leaking drains, waste deposits, such as tipping and sewage treatment sludge, and air pollution. The quantitative threats to ground water come from draining off, damage to natural underground reservoirs, for example from gravel quarrying, drops in the water table caused by over-exploitation, insufficient replenishment of aquifers as the soil becomes less permeable and reduced flows in certain stretches of river or the filling in of their beds.

MEDIUM-TERM DEVELOPMENTS

Far from diminishing, these threats will continue to grow.

OBJECTIVES

– extend the water supply system to ensure security of supplies in times of drought or other crises;
– improve the treatment system by encouraging the separation of polluted and non-polluted water, repairing leaking drains and supervising private link-ups;

– introduce fully the polluter-pays principle, with all the costs of water supply and sewage disposal and treatment being taken into account;
– constantly improve the running of existing facilities.

ACTION REQUIRED

– establish protected areas for ground water;
– avoid emissions of dangerous substances at source;
– monitor substances and processes that could threaten ground water supplies;
– take steps to protect water supplies in construction and other operations;
– investigate and encourage working and operating methods that do not pose a threat to water supplies;
– monitor results and react accordingly.

2.3.5. Protection against damage caused by water

CURRENT SITUATION

Much has been done over the centuries to provide mankind with protection against floods. Major engineering works have been undertaken to modify the course of rivers, torrents have been brought under control and improvements made to flood retention basins. Together with measures to prevent erosion and the transport of sediment, this has all helped to reduce the risk of flooding in many areas.

MEDIUM-TERM DEVELOPMENTS

The intensive use of available land has increased the potential for damage, calling for still more protective measures. At a time of heightened awareness of environmental issues, flood protection needs to be viewed from a fresh perspective. In addition to purely civil engineering projects, land-use and regional planning measures, involving river maintenance specialists, are becoming increasingly important.

OBJECTIVES

– proper river maintenance, land-use and regional planning measures and appropriate engineering works must all be used to offer protection against flooding.

ACTION REQUIRED

– assess the risks, distinguish between the various objectives and plan the response accordingly.

It is possible to restrict, or even prevent, an increase in the potential damage by avoiding at-risk areas and introducing building and land use regulations, such as prohibiting construction in very high-risk areas, local protective measures and rules governing the cultivation of agricultural areas.

2.3.6. Effects of climatic changes on alpine water resources

CURRENT SITUATION AND MEDIUM TERM DEVELOPMENTS

The possible effects of climatic changes on the alpine water cycle may be summarised as follows:

– an increase of a few percent in annual average precipitation;
– more frequent heavy rain in summer;
– a smaller increase in the annual average discharge of water;
– the glacial equilibrium line will rise by approximately 200 m;
– temperatures will rise in the permafrost regions, whose surface area will decline;
– the average snow line will rise by 300 to 500 m, causing losses to the skiing industry;
– at an altitude of 1 500 m, there will only be snow cover between mid December and early March;
– flood basins will not require such a large capacity since the river systems will be subject to less seasonal variation;
– it will be possible to produce more energy in winter, but less in summer;
– changes will have to be made to the regulations governing the management of natural and artificial lakes;
– increased flows of water in winter may lead to any noxious substances that are dumped being more diluted;
– there will probably be more frequent mud spates and a larger quantity of sediment transported.

As has always been the case, it is not possible to transfer the results of the general atmospheric circulation model to the hydrological field, either fully or with the necessary precision. For example, only limited forecasts can be made of changes in the frequency of rivers in spate in the Alps.

OBJECTIVES AND ACTION REQUIRED

– develop a basic understanding of the way climatic changes influence the water cycle;
– draw up forecasts of climatic changes' consequences and extend the environmental observation network to make preparations for dealing with the issue.

2.3.7. The role of water management in regional projects and planning

It is crucial for more account to be taken of general water-related issues in the design of industrial and infrastructure projects, land use planning schemes and the development of rural areas. Regulations must be introduced to reduce or prevent environmental disruption; the regulations must be monitored and, where appropriate, installations must be dismantled. The cessation of activities such as the exploitation of natural resources or the storage of products may pose a threat for the environment and other water uses. The cessation of such activities is often accompanied by a transfer of ownership and responsibility, making it even more necessary to build in a requirement, from the very outset, for sites to be restored to their original state.

It will first be necessary to co-ordinate water management and regional and land use planning. Moreover, the prior impact studies and notices that are now mandatory for development proposals above a certain scale must no longer be confined to purely local and limited effects.

Developers, for example, will be required to acquire at the earliest possible stage the necessary knowledge to enable them to incorporate an overall approach to water-related matters into their designs. Moreover, existing compensation machinery will be monitored to ensure that the environment is protected.

This will therefore involve:

– co-ordinating water management and regional and land use planning;
– incorporating the overall management of water into project designs;
– guaranteeing that sites will be fully restored once activities have ceased.

2.3.8. Main strategies in the water sector in the Alps

The following main strategies have emerged from the analysis of the situation in the Alps:

a) protecting ground water:
– preventing the deterioration in quality arising from widespread pollution and the over-exploitation of ground water.

b) reducing contamination caused by toxic substances:
– reducing individual waste items and using clean techniques to prevent pollution;
– restoring contaminated sites.

c) improving anti-pollution measures:
– sewage collection and treatment, preventing accidental pollution, reducing rainwater pollution and using environmentally benign products and processes.

d) restoring rivers and aquatic ecosystems:
– qualitative and quantitative protection of rivers, preserving river banks and beds;
– protecting and restoring biodiversity;
– ensuring an adequate flow in rivers.

e) ensuring continued availability of water resources:
– making drinking water permanently available;
– safeguarding energy production, navigation, leisure activities and so on.

f) incorporating water management into development projects:
– urban and industrial development projects and major public works such as motorway or power station construction must take account of water-related issues from the outset, while regional planning must be concerned with flood prevention.

g) protecting individuals and groups against damage caused by water:
– identifying areas liable to flooding and exercising strict controls over urban development in areas designated for expansion;
– protection against mud spates;

– improving flood warnings.

2.4. Strategies for the sustainable management of freshwater resources in the states of the Mediterranean basin

2.4.1. Current situation

It is comparatively simple to demarcate according to the hydrographic concept of watershed the zone constituting the Mediterranean basin, and to identify the states concerned. With regard to water resources, it should be observed that the Black Sea is usually considered as separate from the Mediterranean environment although the two seas are linked. The countries geographically part of the European area which have land draining towards the Mediterranean can be classified as follows:

a) Riparian countries:

– those whose entire territory is in the Mediterranean basin: Italy, Malta, Albania, Greece and Cyprus;[7]
– those only part of whose territory lies in the Mediterranean basin: Spain, France, Portugal, Slovenia, Croatia, Bosnia, the Serbia-Montenegro Federation and Turkey;[8]

b) Non-riparian countries: Portugal, Switzerland, Bulgaria and "the former Yugoslav Republic of Macedonia".

There are states whose natural water resources originate principally from the territory of neighbouring countries: Greece, Albania, Portugal, France and Turkey[9] (together with the former Yugoslavia, though only part of its water resources empty into the Mediterranean); as a result, these states are dependent for their water resources on the decisions taken by the other countries.

Insularity, which may characterise the entire national territory (Malta and Cyprus) or only part of it, gives the areas concerned certain peculiarities and greater exposure to hydrological problems.

Water management by state authorities has a varying influence on the Mediterranean environment. The riparian countries' management exclusively and directly affects the sea, while in the case of the non-riparian countries occupying the upper reaches of river basins divided by national boundaries, the consequences are borne firstly by the countries downstream and secondly by the sea.

The consequences are not only quantity of available water (e.g. diversion of some of the run-off which would otherwise follow its natural channel), but above all pollution (inadequate treatment lowering the quality of the water used). Impact on the marine environment is of course felt solely by the riparian countries.

7. Libya to the south of the basin.
8. Syria, Lebanon, Palestine, Israël; Algeria and Morocco to the south of the basin.
9. Among the Southern countries, Egypt in particular, Syria, Israël and Tunisia.

Another consideration is that in the countries possessing non-Mediterranean watersheds, certain decisions on management of their water resources to meet the needs of Mediterranean territories may affect third countries (e.g. Spain and Portugal where there is transfer from the Tejo to the Segura river basin). Such decisions, indubitably commanded by wider territorial strategies (usually in the national context) and warranted by regional policies or specific sectoral requirements, broaden the scope of water problems for the Mediterranean areas.

The "Mediterranean basin" is actually a composite area, intricately demarcated, typified by multiple interrelations, and comprising not only the countries in the European sphere but also those of North Africa and the Middle East, an area where hydrological problems have differing and specific dimensions for each country.

Rational and sustainable water management in a spatial context of this kind is top priority for many international institutions which have devised various types of action plans and programmes (UN, OECD, Council of Europe, European Union, World Bank, NGOs, etc.).

2.4.2. Specificities of freshwater resources management of the Mediterranean basin

The chief problems with which the European countries must contend as regards management of water resources in their Mediterranean catchments can be summed up as follows:

a) Environmentally harmful external factors:

– Extensive deterioration in water quality, essentially due to inadequately treated urban and industrial effluent and, to a lesser extent, agricultural use (pollution).

With the exception of Albania, considering its low level of activity, this problem is virtually universal throughout the basin, even in countries with very plentiful water resources such as Croatia. It highlights the ineffectiveness of the legislative framework regulating water preservation and the inadequacy of environmental cost accounting in production processes.

– Excessive tapping of water-bearing geological strata, which seriously threatens to expend this natural resource and render it unusable by raising the salinity.

This problem affects all groundwater tables of the Mediterranean coast lying in countries with significant water deficit (most severely in Malta, but also in Cyprus and Spain). Although it also occurs elsewhere in these countries it does not attain the same level of intensity and can therefore be viewed as a local phenomenon.

– Degradation of water-dependent ecosystems (wetlands in particular).

b) Great irregularity of water resources governed by climate and relief:

Geographically, there is a striking North/South dualism, i.e. between the European part and the remainder of the Mediterranean basin. In the south, the availability of renewable natural water resources per capita is less than one-fifth of the figure for the north. Within the European sphere some countries also contrast with the rest, particularly Malta and Cyprus, and to a lesser extent Spain. The limited potential of these states would warrant their classification as Southern countries. At a sub-national level there are also large imbalances of various kinds: local (Greece, Italy and the islands of the former Yugoslavia) or regional (in Portugal and in Spain, the per capita potential around the Mediterranean basin is approximately one-third the level for the rest of the country).

Chronologically, the extreme seasonal and year-to-year irregularity also causes frequent shortages (drought and flood). The widely differing intervals of rainfall, together with evaporation, largely determine the management of the water resources in the catchment areas and bring numerous regularisation infrastructures into use.

c)Structural deficiency of natural water resources in certain countries:

Malta must use desalination to produce over 80% of the water resources needed to meet the national demand. The data on indicators presented in the following table concern total discharge per capita and water resource consumption indices (ratio of total drainage to overall demand). It should be emphasised that these data are to be used with caution, having been calculated on the basis of averages derived from disparate sources which may refer to more serious local situations.

Figures below 2 000 m^3 per capita per year show that critical situations of water shortage may arise. Consumption indices of above 50% point to serious risks of overloading available resources and of heavy local pressure, especially on quality. In all countries the water resource consumption index in the Mediterranean part is close to or below the national average, except in Spain where it is double that figure.

Supply for piped water in towns is not a problem for all states of the Mediterranean basin. Population shift towards the coast, aggravated by tourist crowding in the summer months, nevertheless causes ever more frequent crisis situations. Attention should be drawn to the severe difficulties in Malta and other islands, as also in certain continental locations (Spain) where high costs are incurred for desalination in order to secure adequate water quality for urban use.

Total water discharge per capita and consumption indices

COUNTRY	TOTAL WATER DISCHARGE PER CAPITA IN THE MEDITERRANEAN BASIN (m^3/year)	CONSUMPTION INDICES IN THE MEDITERRANEAN BASIN (%)
SPAIN	1 909	64.3
FRANCE	5 827	23.2
ITALY	3 262	24.8
MALTA	<200	>>100.0
FORMER YUGOSLAVIA	28 700	1.9
ALBANIA	15 385	5.9
GREECE	5 836	11.8
TURKEY	5 000	10.0
CYPRUS	1 286	42.0

Source: Regional Activity Centre of the MAP-UNEP “Blue Plan”

d) Large agricultural water demand in the Mediterranean part of the countries:

The irregular hydrological cycle precludes good agricultural yield from land not under irrigation. In order to remedy this drawback and cope with seasonal peaks in demand for certain agricultural products, large-scale works to regulate water resources for irrigation have been necessary. Except in France and former Yugoslavia, countries where the agricultural water demand represents about 15% of the aggregate demand, demand generally exceeds 70% and verges on 85% for Greece and Cyprus. The reason for the high proportion of water resources devoted to irrigation in Albania and Turkey is the importance of the agricultural sector, which is also true to a lesser extent in former Yugoslavia and Greece.

e) Problems relating to certain phases of the hydrological cycle: soil erosion and silting of dams:

Soil erosion accentuates the hydrological deficiencies of catchment areas by reducing the soil's water retention and also depleting its natural resources; this is a frequent process in a number of drainage basins. Silting of dams results in gradual reduction of capacity and thus water storage. These two problems may have serious consequences in the more southerly areas with very steep terrain and irregular rainfall, where desertification is observed to be spreading.

f) Political problems arising from joint management of international basins:

The situation specifically concerns Albania, Greece, Turkey, France and Portugal.

g) Institutional problems:

In several countries, an unsatisfactory situation applies as regards the legal and institutional aspects of water resource management (disputed authority and deficient administrative co-ordination), and its economics (no price-fixing for irrigation); the sectoral apportionment of available water resources is also noticeably ineffective.

This situation often originates in the former idea of water being a natural, plentiful and free resource.

Even today, far too many decisions are founded on this idea and insist on the application of engineering measures to solve the problems, such as increasing regulation and making small inter-basin transfers (e.g. in Spain and Cyprus). Upgrading the technical efficiency of water exploitation (improvement of installations) is likewise viewed as a suitable measure even though it offers few lasting solutions to the basic problems.

Nonetheless, increasing awareness of the need for integrated water management can be observed. Several legislative moves have been made in this direction (water laws enacted in Spain, 1985; France, 1992; Italy, 1989 and 1994 amendment; Portugal, Water Resource Planning and Management Act of 22 February 1994; Croatia, 1990; Greece, 1987). Most of these provisions stipulate that planning and management of water resources for each hydrographic basin are to be integrated and placed under master plans for local and regional development. Spain is in the process of implementing a Hydrological Plan at national level; Croatia envisages drawing up a Water Resource Management Plan as an element of the National Development Plan. Portugal is currently drawing up hydrographic basin plans (for all basins) and the National Water Plan.

More extensive international co-operation among the Mediterranean basin countries, together with exchange of experience and technology transfer, should make it possible to achieve better results at lower cost.

2.4.3. Proposed strategy for rational water resource management in the medium term

SUPPLY FORECASTS

For various reasons, it can be assumed that where availability is concerned a “low scenario” will certainly apply to water resources in the Mediterranean basin, especially for the Southern countries.

Indeed, one can expect a global climate change whose effects, though difficult to estimate, will lead to a reduction of rainfall. This change is not altogether certain but if it does occur, its medium/long term quantitative impact on Mediterranean water resources will be very serious and difficult to resolve. According to the IPCC report[10], a temperature rise of 1°C to 2°C combined with a 10% decrease in rainfall could subject the semi-arid areas of the Mediterranean basin to a reduction of more than 40% in the annual volume of rainwater run-off.

10. Vol. II of the report on impact evaluation by the intergovernmental group of experts on climate change (WMO-UNEP).

Another factor liable to restrict water supply potential stems from pressure to safeguard the integrity of the natural environment. This entails the setting-aside of water resources in order to preserve ecosystems, and impedes the development of new regulation infrastructures.

Lastly, it is clear that the construction of new water resource regulation installations is becoming increasingly difficult.

However, technological progress offers hope of progress in the desalination of seawater, although the cost of the water resources yielded would be very high for a long time yet.

If these forecasts are correct, a significant increase in water supply is hardly foreseeable in the short term.

DEMANDE FORECASTS

In countries suffering from shortage of water resources, the largest demand comes from the agricultural sector. This sector, whose competitiveness substantially depends on the scope for irrigation and the varying level of subsidies allocated to it (within the European Union, the CAP does not grant Mediterranean agriculture such large-scale assistance as continental agriculture). Today's heavy pressure on water resources can be expected to persist in the southern countries of Europe, in view of the competitiveness imposed on the agricultural markets in accordance with the GATT agreements.

Even leaving out of account the climate change scenario, the above forecasts show a decrease of between 10% and 20% in the per capita discharge coefficient in the countries where it is lowest (Malta, Cyprus and Spain), slightly less in the other countries. These forecasts may be influenced by demographic and migratory fluctuations.

Water quality will come under serious indirect threat from worsening shortage of water resources and on-going evolution of technological processes. Higher priority should thus be given to processes for purifying residual water.

SUGGESTIONS

When there is a structural shortage of water, as happens in certain deficient zones of certain countries, lack of resources may form an impediment to economic development. In the Mediterranean basin, water is to be regarded as an economic asset in that its use is subjected to ever-higher costs.

In order to achieve sustainable development in the medium/long term, it is essential that water should be used as effectively as possible. This calls for proper apportionment at the sectoral and territorial level. How, though, is the channelling of water into the most productive uses to be secured?

Supply and demand cannot be satisfactorily balanced until the users learn the real cost of water consumption to society. This cost is the “marginal long-term cost” of water, i.e. the cost incurred in order to obtain additional quantities of water by means of new supply systems. It therefore embodies not only infrastructure costs (investment, management), but also external factors of many kinds (environmental; indirect costs for other users; etc.).

Water resource management practice hitherto is not founded on this principle in most countries, even though some partially apply it with regard to water quality (“the polluter pays” principle). Regarding quantity, there is a widespread tendency to subsidise the cost of water for irrigation, the principal consumer, because of the difficult production conditions in the agricultural sector which needs economic aid to survive. Such aid might take other forms not endangering natural water resources.

Application of prices commensurate with the real cost of water would inevitably have appreciable territorial effects, depending on the natural conditions and the comparative advantages of the various zones, and would thus cause significant differences in competitiveness. For that reason, water management is a crucial issue of spatial planning. Not only long-term costs but also long-term benefits and/or savings must be taken into account (e.g. the protection of biodiversity thanks to Mediterranean agriculture, the prevention of rural depopulation and the curbing of the population drift towards the coast).

Introducing a water resources management policy based on an economic criterion taking in all aspects related to its use is not straightforward and entails the adoption of suitable regulations, possibly leading to alterations in the legislative, institutional and administrative framework of the states concerned. Beforehand, co-ordinated allocation of responsibilities for both supply and consumption is indispensable at all levels of management.

Where demand is concerned, three essential requirements should be mentioned: adequate pricing of water, if necessary seeking all possible ways of saving water and re-using certain water as much as possible, co-ordination between sectoral planning processes (particularly between agricultural planning and water resource planning) and a precise legislative framework ensuring that the negative side-effects are limited.

On the supply side, two aspects are closely associated: quantity and quality. These are interdependent and neither can be considered in isolation. Future strategy, by diversifying sources of supply, must continue to eliminate the restrictions dictated by the paucity of water resources. With regard to infrastructure, all alternatives (more regulation by damming, ensuring however that this does not have overly adverse effects on the natural environment; transfers; improvement of consumption-reducing installations; re-use; desalination; etc.) must receive unbiased consideration from the economic and environmental angles.

2.5. Strategies for the sustainable management of freshwater resources on islands

2.5.1. Current situation

The most important problem, related to freshwater resources management on Mediterranean islands, is the existence of persistent drought, combined with a steady increase in freshwater consumption, due to an increase in human activity.

FRESHWATER INPUT (DECREASE IN RAINFALL)

During the past forty years, a steady decrease in rainfall has been observed, in areas of the temperate zone, where mean annual rainfall exceeds 60 cm.

As a general rule, in regions where the highest annual rainfall occurs, the decrease in rainfall is more pronounced, than in areas with lower annual rainfall. In areas with annual rainfall less than 40-50 cm, no decrease has been observed.

On the island of Corfu, for example, total annual rainfall in 1955 was 120-140 cm. In 1995, forty years later, annual rainfall is estimated at 80-90 cm, which corresponds to a steady decrease in rainfall of approximately 1% yearly.

In other areas, such as the islands of the Southern Aegean, i.e. Rhodes, Crete, where annual rainfall in the 1950s was 70-90 cm, a steady decrease is observed of approximately 0.5% yearly. On the Islands of the Central Aegean (Cyclades, etc.) annual rainfall has been constant during the past forty years, at a level of approximately 40 cm (i.e. very low).

Globally, this phenomenon can be expressed in terms of “the climate in islands of the temperature zone above the 38th parallel tending to approximate the climate of islands below the 38th parallel” i.e. a northerly shift in the occurrence of drought, of the lower part of the temperate zone (in the Mediterranean region).

This pattern appears to conform very well with the early symptoms scenario of the “greenhouse effect” according to which, following global warming, a shift of the zone of rainfall occurrence from the equator to the poles will be expected.

As a result, there is a medium term tendency for a decrease in rainfall on most of the Mediterranean islands until stabilisation occurs, at approximately 40-50 cm, i.e. at a level which is totally insufficient to sustain forestry, intensive agriculture and an acceptable population density.

THE DEMAND FOR FRESHWATER ON ISLANDS

While forestry and agriculture have been exhibiting a steady decline on most of the islands during the past seventy years, due to a dramatic decrease in the permanent population, tourist activities are steadily expanding, particularly during the summer months.

Increased touristic activity is recently attracting back the local population with subsequent signs of revival of the declining agricultural activities, partly in order to meet increased summer consumption demands.

As a result of increased touristic and, more recently, agricultural activities, there has been an increasing demand on freshwater availability. Coupled with the phenomenon of steadily decreasing rainfall, a serious shortage of freshwater is observed on most of the islands, leading to the appearance of drought symptoms, such as forest decline, soil erosion, water shortages, salinisation of deep aquifers, disappearance of wetlands, etc.

2.5.2. Foreseeable mid-term developments

The developments mentioned below concern freshwater management, environmental impacts and policy options.

FRESHWATER MANAGEMENT

Growing touristic and other human activities on the islands, in conjunction with water shortage, due to increasing drought episodes, are expected to drive the local population and enterprises to the reuse of household effluents following biological treatment for example for gardening purposes. The dry soil around a hotel or an isolated household, is the ideal receptor for such treated effluents. The cost of effluent disposal through pipelines out to sea is in this way avoided as well as coastal pollution.

The lack of public effluent disposal networks and treatment units is a limiting factor for the reuse of the water for gardening or for agriculture.

It is estimated that after the completion of public networks and treatment units for household effluents on the islands, in a few decades, most of the water will be reused for gardening and agriculture.

ENVIRONMENTAL IMPACTS

The extensive use of limited water resources on islands for household uses, followed by disposal at sea, exacerbates problems related to the occurrence of drought, forest decline, soil erosion and wetland disappearance.

Moreover, the disposal of untreated effluents at sea results in eutrophication of the coastal waters near island settlements.

If a more rational, long-term freshwater management programme, taking into account environmental conservation is not adopted, desertification and pollution (eutrophication) phenomena will be intensified.

POLICY OPTIONS

Although there have been no indications of the implementation of rational policy options on the part of national authorities, it is estimated that under the pressure of European Union Conservation programmes, some rational measures will be taken concerning freshwater

management on the islands.

However, since summer tourism, as the main economic activity, is demanding the greatest share of water resources for household use, it is questionable if additional measures and programmes will actually be implemented for water management taking into account natural ecosystem conservation.

2.5.3. Policies implemented to overcome the problem

No specific long-term policies have been implemented by national or regional authorities to overcome the above-mentioned problems. Only spontaneous and short term reactions have been observed.

POLICIES FOR FRESHWATER SUPPLY

The most visible and urgent problem, i.e. increased freshwater demand, for domestic and touristic purposes particularly during the summer months, is presently dealt with through measures such as:

– deeper drilling;
– long distance transfer of water, through pipe lines, or with water transporting tankers;
– desalination of sea water.

Deeper drillings have limits where water reservoirs are exhausted or salinised due to seepage of sea water into deep aquifers. This situation is usually reached a few years after intensive pumping.

Therefore deeper drilling cannot be considered as a long term solution to the problem of increasing water demand.

Transportation of freshwater has limitations relating to the supply capacity of the freshwater source available, and to other antagonistic uses of freshwater for agriculture.

Desalination of sea water has no limitations regarding water supply capacity. The limitations are financial, due to the high investment and functional costs. It is estimated that the cost of a cubic meter of desalinated water cannot be reduced to less than 3 ECU.

Such a cost is hardly affordable for an island household, but easily affordable for a tourist family taking into account that the water cost per person consuming 0.3 m^3 daily amounts to 1 ECU per day, whereas accommodation costs only, are not less than 10-20 ECU per day.

POLICIES FOR OTHER USES OF FRESHWATER

Since tourism is the most profitable activity on the islands, it has a high priority as regards water allocation.

The remaining demand, following household (including tourism) consumption is for gardening and agriculture in limited areas. The expansion of these activities is immediately dependent upon water supply capacity.

As food is mainly imported on islands, using capital from tourism, agriculture plays a secondary role in these areas, with virtually no effect on the local economy.

There is no concern for other land uses, except housing and coastal exploitation.

There is no water policy for agriculture, forest or nature conservation.

2.5.4. Strategies required at regional and European level

TO MANAGE AND USE FRESHWATER RESOURCES IN A MORE RATIONAL AND SUSTAINABLE MANNER

Rational and sustainable use of freshwater resources mainly involves the avoidance of irreversible effects on the natural and human environment. Freshwater resources must be used in such a way that forest decline, desertification, soil erosion, salinisation, loss of wetlands and cultural heritage are avoided.

Islands as "closed systems" must use and manage their own water resources, expecting, in exceptional cases only, inputs from the exterior and, in any case, in limited quantities.

Islands, as regions with low rainfall, must generally be seen as systems presenting a deficit in their water resources balance and this "deficiency", is the main constraint that must be taken into account when considering sustainable use.

The following steps must be followed for the establishment of a freshwater resources management plan:

a) a census of freshwater resources and formulation of a rational balance between water supply (rainfall) and demand (natural and human uses);

b) identification of irreversible effects on the natural and human stability of the "closed" island system, i.e. soil depletion, loss of forest cover, wetland degradation, etc.;

c) establishment of a new equilibrium for water resources, in order to prevent the irreversible effects by supporting sustainability of the natural and human environment;

d) a basic element for the new equilibrium is the assurance of the provision of at least the minimal quantity of water for every use and function related to the natural and human environment;

e) as the freshwater balance in most of the islands presents a clear deficit, the assurance of the above minimal quantity of water is not an easy task. Priorities must be taken into account;

f) a first priority, related to the establishment of a new equilibrium for water resources on islands, is natural ecosystem conservation in order to reduce forest decline, soil erosion, salinisation, desertification and wetland degradation. The maintenance and improvement of the existing forests and soil, will improve in the mid-term the hydrological balance of islands and subsequently water supply for other uses. A top priority in this direction is the urgent need for measures to conserve and maintain the traditional practice of "terracing" on hills and mountains used in island cultivation and agriculture and measures for the containment of the flow of winter streams and torrents (by means of stonework, placement of logs against the stream flow, etc.);

g) sustainable agricultural practice must be seen as a second priority, for the establishment of the new equilibrium for water resources on islands. Intensive irrigation, especially where groundwater is used, must be confined to areas and seasons where a clear surplus of water exists. Extensive use of groundwater will undermine the efficiency of the measures and actions mentioned above (point f), for the conservation and improvement of natural ecosystems. Types of crops and cultivation methods must be selected under the criteria of best soil conservation and least water demand. Cultivation of perennial plants and trees such as figs, olives, vines, carobs, etc., must be preferred over annual plants or those generally demanding a high water supply. Organic farming must be promoted as a means of soil improvement and prevention of erosion. Moreover, sustainable irrigating methods (drip irrigation, etc.) must be urgently adopted, i.e. which consume and waste much less water than the traditional methods. The necessary investments must be subsidised by national or Community subsidies;

h) proper management of water for household use must be seen as a third priority, in order to replace present ineffective and unsustainable management schemes (described above). The main practice for proper household water management is recycling, i.e. collection after use, treatment to "irrigation grade" water quality, and subsequently use for gardening or agricultural purposes. Through this approach, household water will not affect the freshwater balance of the area. Supply of freshwater for household uses, other than sanitary purposes and drinking water, must be confined to areas and seasons where a clear surplus of water exists. As it is well known that household water demand is very high during the summer season due to tourism, specific measures and actions must be undertaken to cover this increased demand, without adversely affecting the environment. Carefully planned small dams and small freshwater reservoirs may be a solution. Transportation of water by water tankers or desalination of sea water, could be considered as supplementary measures to increase reservoir capacity during the height of the tourist season. After recycling, the water can be reused for irrigation, gardening and, in some cases, reforestation. In this way, transportation and desalination could make a positive contribution to the hydrological balance of the region, increasing total water supply, not only for household needs, but also for sustainable agricultural and environmental conservation uses;

i) proper management of industrial water can be considered as a fourth priority due to the small volume consumed on islands, in comparison to other uses. As the few industries on islands are mainly food processing units, their waste water is of a similar quality and constitution to that of household effluents. Management is therefore identical to that of household effluents, i.e. treatment to an “irrigation grade” quality and then recycling for other uses.

The proposed freshwater management scheme for islands supports environmental conservation, local agricultural production and permits the development of tourism and industry, as long as these activities provide for their share in the maintenance of the freshwater balance.

TO PREVENT POLLUTION AND TO MONITOR THE QUALITY OF FRESHWATER ON ISLANDS

The strategies proposed for freshwater management on islands are at the same time the best practices for pollution prevention. Water conservation for the protection of natural ecosystems, minimisation of water for irrigation and recycling of effluents and waste-water, protect the environment from pesticide, fertilizer and organic pollution (eutrophication).

The above can be better explained through consideration of the relevant Directives of the European Union regarding the quality of bathing water (76/160/EEC and 91/692/EEC) which set quality requirements such as total coliform: 500/100 ml (guide value), methylene blue surface active substances: 0.03 mg/ml (guide value), no tarry residues or floating materials (guide value), etc.

Such requirements can in no way be exceeded following advanced liquid waste treatment.

Furthermore, the nutrient (P,N) load to soils, through irrigation with treated wastes is so low, that it can be considered negligible in comparison to the quantity of nutrients contained in chemical fertilizers which are routinely applied in agriculture or gardens.

3. National strategies for integrating sustainable freshwater management into regional planning policies

3.1. Agriculture

SITUATION IN ITALY

Institutional and legal framework

Between 1989 and 1995, the Italian laws on land and water, water management and the planning of river basins experienced a great modernisation. In many aspects, the present regulations and institutions on land and water use and protection are among the best in Europe, whereas up to 1989 they could have been considered highly inadequate.

The River Basin Authorities were created in Italy by the 1989 bill n° 183 (the so-called Difesa del Suolo), sixty years or so after their establishment in the URSS and the USA: which conferred to the "Basin Plan" (Piano di Bacino) the status and powers of a master plan for the use, consumption and protection of both water and land. Immediately after, the 275/90 bill gave full regulations and implementation to the above; the 275/93 decree and the 36/94 bill (Risorse idriche) organised the use and management of water for human consumption under a single authority (for intake, potability, distribution, sewerage and purification) and gave to all waters the status of public good, strongly promoting (in aims) the autonomy of irrigation and reclamation developers. The 36/94 and 37/94 bills, together with the 183/89 bill, had a highly positive effect on the environment, putting a stop to artificialisation of rivers and to land consumption.

A positive effect is recognised in the European directives on the quality of water: their introduction has been among the reasons that instigated the 36/94 bill. Set-aside or land erosion directives were also useful: in the same way the absence of a European regulation on irrigation is among the reasons of the limited and uncertain improvements experienced in this sector.

An important role indeed is still played by the powerful Consorzi di Bonifica, created in execution of a famous and revolutionary law (Bonifica Integrale), dated 1923. They are a sort of association among private landlords, to whom the law gives official status through a provincial approval.

They played a historical role in land reclamation in Italy, mainly before the war, when malaria was still a major plague and a critical hindrance to the development of humid areas; during the following decades they were shifting their action to the irrigation sector, managing to convey huge investments towards major waterworks and extensive distribution networks: but today they are considered obsolete and often negative. The members' contributions hardly cover the running expenses: while capital investments of any type are granted by the government; moreover, an additional contribution of 8-12% of every investment is recognised as general expenses. As a consequence of that, every consortium is practically obliged to invent new work and contracts every year as a matter of survival: a lot of them (hundreds of thousands of kilometres of rural roads, thousands of river-dressing or basin management works) are clearly unnecessary from a technical point of view and severely damage the environment and the landscape.

Macro-economic and social changes, and major adjustments of European policy were expected to greatly affect irrigation demand: but the lack of regulations and the lobbying power of farmers' organisations and building contractors is still tempering such an effect.

RESOURCES DEMAND AND CONSUMPTION

The relative consumption of water in agriculture (35 billion m^3, almost 80% of the global water intake in Italy) is probably the highest in Europe and among developed countries of a temperate climate outside of Europe.

From the hydrological point of view, Italy is a temperate country, as far as annual precipitation and regional distribution are concerned even if variations from one spot to another of its reduced territory are not small (the average rainfall is 450 mm in Sicily and 1200 mm in Friuli). The annual distribution of rain is also uneven, with three months of drought (even five in many regions) from springtime to summer and an almost general absence of rain in the hot season.

For these reasons agriculture has experienced, through the centuries, a strong specialisation in rainfed crops of short duration (like cereals or potatoes) or in highly resistant perennial plants, like grapes, olive trees and alfalfa. As it is known, the practice of irrigation is as old as agriculture itself in the Mediterranean basin, long before the birth of rainfed agricultural practices: and it maintained in modern times its fundamental role in granting high yields of certain cereals, and even more for fodder and vegetables and for greenhouse-products (vegetables, flowers).

Together with intensive use of chemicals and pesticides, (perhaps the most intensive in the world) yields as high as fifteen tons per hectare of maize were reached in the Po valley, or triple the amount of the yearly crop of carrots in the Fucino reclamation basin.

SITUATION OF MAJOR IRRIGATION SCHEMES IN ITALY

An overlook at national level shows a high degree of irrationality.

The amount of permanently irrigated areas reached is certainly the highest in Europe: something around 5 millions hectares irrigable land and 3.5 to 4.5 million actually irrigated every year. It is more than one third of the whole arable land in Italy: 13 million hectares.

The relevant costs of plant and implementation, when including the cost of the dam or other major regulation or intake waterworks, is clearly very far from any possible economic justification. Two recent schemes, Consorzio di Bonifica Baraggia Vercellese (Piedmont) and Consorzio di Bonifica Paludi di Scicli (Irminio, Sicily) reveal construction costs of 120 million lire (80 thousand dollars) per hectare. It should be recalled that the purchasing cost of hectare of dry land does not exceed 10 million lire; the increase in gross saleable production per year is no more than 5 million, and the increase in income/cost difference no more than 3 million per hectare after irrigation.

In addition it should be noted that the system of non-reimbursable aid currently in use by *Cassa per il Mezzogiorno* or FIO/EIB greatly influenced the design patterns and strategies. Design options for water conveying and distribution were currently kept to a pure gravity system, employing much bigger pipes or even tunnelling in order to avoid any running expenses for the

schemes, like pumping, even if it is much cheaper at a global level.

Environmental consequences are great: more than one hundred new major dams implemented in Italy in the past thirty years; thousands of kilometres of river dressing and canalisation, together with extensive land levelling, have seriously damaged or simply sentenced to death most of the sandy shores of the peninsula. Almost 80% of the 6000 km of low coasts show dramatic processes of erosion at present; of the 20% remaining the ones belonging to Sardinia will also soon disappear due to an irrigation programme of thirty-two dams for 800 000 hectares already approved and being implemented.

In the Mediterranean climate no "multipurpose" utilisation is possible for reservoirs: irrigation, water supply (drinkable or industrial), flood control and hydropower have different requirements and are all competitive and conflict with one another. The margin for mutual compensation is very small. Even so, many major dams have been financed on the assumption of their multiple function. The small share of resources set aside for human consumption (the cost of which is high) have been used to compensate the very low (if any) internal rate of return of the share set aside for irrigation. Since the cost/benefit analysis calculations are based on the "with/without" comparison of alternatives, the final result comes out as clearly positive. But this procedure fails to analyse project alternatives for human consumption (like aquifers or natural lakes or streams), the cost of which is normally much lower and the quality much better. But still today huge dams (Montedoglio, Arezzo or Alento, Salerno or Ingagna, Vercelli) which are supposed to provide water for irrigation, manage to sell their low quality resource to supply consortia, even though treatment costs make it prohibitive.

Just in these last few years a positive effect has been noticed with the introduction of rising standards for drinking water, in line with European regulations, like the 80/778 Directive, that establishes (as the 36/94 bill does) priority destinations for resources of a different quality.

Perhaps the most significant example of an unsuccessful combination of different water uses is *Ente Autonomo Acquedotto Pugliese-Lucano*, where huge investments which are economically unsound and environmentally harmful have been justified. This scheme conveys more than one billion cubic meters to the Puglia region, from four different regions. The piped resource, often of high quality and originally thought for human use, is now mainly conveyed to extensive cereal plantations. The fact that the intake basins are quite small ("regional basins", according to the 183/89 bill) has prevented, up to now, any effective control from the river authorities or the water supply bodies (36/94 bill). The pressure of the building contractors' lobby is still so high that a promotional committee has been set up to study the feasibility of carrying water from Albania.

Despite the above-mentioned problems, the public control (on soundness and rationality) of water investments in agriculture is improving. In the 183/89 bill, an article was included (with the contribution of the author), prescribing a technical and economic feasibility study for new dams, instead of the widely abused and practically useless environmental impact assessment.

Still in 1991 a consortium received state financing and started building a 100 million m^3 dam at Vetto between Parma and Reggio, with the aim of irrigating land to grow fodder to protect the production of parmesan cheese: at the same time Italy was being fined for 3.5 billion dollars by the EC for exceeding milk production quotas. The curious thing is that the Ministry of Environment approved the contract and managed to have it approved by the Basin Authority:

until the Ministry of Public Works was called in to stop the project and revoke the financing.

Possible strategies

NEEDS AND TRENDS

Since there is no real chance to export Italian products of sowing cultivations (which cover most of the irrigated areas), it is clear that possible domestic consumption requires a much higher supply. Non-food crops (like tobacco, biomasses and fibres) being economically unprofitable (and clearly not recommendable), a global reduction of cultivated lands seems to be imperative.

Therefore, agricultural demand for water cannot exceed the present 35 billion m^3 intake (and 25-30 in use). Today, all the dams either newly planned or under construction are useless (the above-mentioned Sardinia plan foresees the construction of another thirty-eight new ones); big abductions appropriations, even from already existing dams, can be carried out only when they substitute unfit or inadequate intakes, such as from wells.

An immediate and potential rationalisation should reduce equipped hectares to 4 millions, and irrigated ones to 2.5/3, which, thanks to a modern system of sprinklers, would not exceed 10 km^3 (billions of m3) of water at the source (half of the water used today). Irrigation of tree cultivations (except citrus trees) and that of temporary "aid" can make use of another 1 billion m^3: 11 altogether. Furthermore, it can be noticed that 4 billion hectares would be enough to "feed" 100/150 million people.

SEASONAL BALANCE

Obviously, the most interesting data concern seasonal demand. Almost a third of present general consumption, i.e. 10 billion m^3, is concentrated in July, after two months of drought, when the majority of rivers run virtually dry. Using aquifers as regulators would sensibly reduce the need for regulation in reservoirs. Throughout Italy, aquifers are credited with a self-refilling capacity of 15 billions m^3.

The *Piano di Bacino dell'Ombrone* clearly showed that had some flows been used in the winter for drinking and industrial purposes, using aquifers only in the summer, these would have met every summer need (irrigation, drinking water either for tourist and private use, and so on), either by means of direct welling or overflow in the draining streams, which has decreased in the past few years due to the lowering on the water table.

Supposing that two thirds of the above-mentioned 12 billions (that is 8 billions), which will be needed in the future, should be used in July/August, it is clear that 5 to 6 billion m^3 should come from regulations (dams), with a necessary and similar storing capacity (due to the very limited summer refilling), corresponding to roughly seventy-five dams with an average of 40 million m^3 each. It is worth noticing that in Italy the total capacity of great reservoirs is about 11 billion m^3, perhaps half of which are used for irrigation; and the total number of "big" dams is 600. This implies that many dams must be redesigned – for brief regulation with a total flow of flood – or even dismantled.

TERRITORIAL AND ENVIRONMENTAL EFFECTS

The serious environmental damage linked to the use of water in agriculture has already been described.

Reopening of disused reservoirs and a better management of the others (together with hydro-electric ones which are no longer profitable), would lead, in the short run, to recovering the profile of Italian rivers and therefore to a progressive reconstruction of its eroded shores.

The competitive pressure on other uses (which are already on the decrease and reach much lower values than irrigation) would be clearly lessened. Areas of dramatic physical and social stress, like Puglia, would experience a great change.

SITUATION IN THE NETHERLANDS

Reduction of water pollution caused by nitrates and pesticides used in agriculture as well as by waste from intensive domestic animal husbandry.

DEVELOPMENT OF THE NATIONAL LEGAL SYSTEM

The planning and legal system covering ground water and surface water is based on several legal and planning instruments.

The quality of surface water is controlled at the national level by the Pollution of Surface Water Act, while separate laws on ground water and environmental policy together regulate the quality of the ground water.

Needless to say the existing well developed system of spatial planning has considerable effects on overall water management.

The national planning instruments act as general frameworks. In general terms the national instruments regulate authorisation. With regard to the qualitative aspects of water they are operational at the provincial level, the level at which instruments regulate the application (Bergen *et al*, 1995).

Since the early 1990's the provinces have begun to integrate the traditional plans for ground water, water quality and water quantity into one single water management plan.

THE STATE OF THE ENVIRONMENT

Since the early 1970s a massive programme has been carried out to improve water quality. Measures aiming at a reduction of industrial and urban water pollution have been particularly successful regarding oxygen binding compounds and heavy metals (CUWVO, 1988).

The greatest problems remaining are at the moment eutrophication and organic micro-compounds. Many of these pollutants are discharged at the so-called non-point sources, in particular agriculture and overflowing sewage systems that, following heavy rainfall,

discharge excess sewage into the surface water system (Bergen, 1995). In the surface water system this discharge leads to a so high level of pollution that the use of surface water for drinking water by cattle is more and more questioned (Sleurink, 1996)

But it is also a large scale problem in the Netherlands, where three important rivers have a lowland river character and thus sedimentation leads to heavy pressure on the underwater soil and the river forelands from a diverse mixture of pollutants, attached to clay particles.

An integral analysis of the state of the environment has shown that emissions by agriculture make a major contribution to the environmental problems in the Netherlands, and that these problems are concentrated in the eastern and southern parts of the country (Bekhuis *et al*, 1994).

REDUCTION OF EUTROPHICATION: MANURE POLICY

Agriculture is responsible for 30% of the phosphate and 75% of the nitrate eutrophication of surface water.

In terms of the Nitrate Directive (nitrate in ground water should not exceed 50 mg/l) the situation measured at the ground water wells gives cause for concern. In two pumping stations that extract ground water from soil strata below 30 metres, this level has been exceeded. Close monitoring of 100 agricultural holdings (a representative sample), however, showed that in 95% of all cases this nitrate norm is exceeded in the upper soil layers, and in 50% of all cases more than 200 mg/l was measured (Koshiek, 1994). The conclusion is that a massive amount of nitrate slowly infiltrates the deeper soil layers, threatening the drinking water supply.

REDUCTION OF ACIDIFICATION: AMMONIA POLICY

Agriculture is responsible for 90% of ammonia emissions in the Netherlands, that cause 50% of total acidification (Ministerie van Landbouw, Natuurbeheer en Visserij, 1995). The emission of ammonia into the air is prevented by restricting the period in which manure may be applied to the growing season and by stating explicitly the techniques allowed for manure spreading (only techniques causing little emission are allowed: on grasslands manure has to be injected into the soil, on arable land ploughing is necessary within a day of manuring). On the farms slurry has to be stored in covered basins to prevent emission into the air.

The enlargement of dairy farms and intensive pig and poultry farms is only permitted if there are no woodlands or nature reserves in the direct vicinity of the farms.

PESTICIDES

The proportion of agriculture in total pesticides used in the Netherlands is 65% (Koshiek, 1994). The use of pesticides in agriculture in terms of active substance is high (10 kg/ha). It is thought that 95% of pesticides in ground water and smaller surface waters stem from agricultural use (Vewin, 1996).

The legal basis of the use of pesticides in the Netherlands is the Pesticides Act that embodies three environmental criteria: persistence in soil; sensitivity to washing away; and the risks to water organisms. Since 1995 the act has been harmonised with the European directives on the authorisation of pesticides. All ground water in the Netherlands is regarded as a drinking water

source, so a uniform standard of 0.1 µg/l for every pesticide is the uniform standard for washing away into ground water over the whole country (Vewin, 1996).

The actual policy implementation has been formulated in a multi-year plan that in 1991 devised a three part strategy to be realised in the year 2000:

a) A clean-up policy: reduction of dependency on pesticides. Many pesticides with too damaging environmental effects will have to be withdrawn;

b) A volume policy: reduction of use of pesticides: 30 - 35% in 1995 up to 50% in 2000;

c) An emission policy: reduction of pesticide emission in the environment: 40-45% into ground water in 1995 and 75% up to 2000. In 1995, 70% into surface water and 90% up to 2000. (Nefyto, 1995).

The authorisation policy is carried out at the national level; it is generic and based on the monitoring of the behaviour of every specific pesticide and not on goals in terms of water quality. The regional or local water manager can prohibit the application of an authorised pesticide but only if a causal relationship between specific use and environmental damage is obvious.

The volume policy has at first sight been successful. The use of pesticides in agriculture in terms of active substances was reduced between 1984 and 1994 by 44% (Adriaanse et al 1994). However, the strongest reduction has been achieved in pesticides for soil-decontamination (75%), followed by herbicides and insecticides (+/- 30%). Fungicides remained stable while the use of other chemicals (e.g. growth regulators and repellents) has increased (Nefyto, 1995). The emission of pesticides into ground water has followed a similar pattern. This result has been described by the drinking water producers as a great success (Vewin, 1996).

The effect of the reduction of use on water organisms has been slower. Despite these reductions, the environmental standard of 0.1 µg/l is still exceeded in a massive way (Reus). The association of drinking water producers (Vewin) and environmental organisations regard the first phase of the cleaning-up of pesticide use to have failed. Additional agreements between pesticide producers and the authorities that, in order to speed up assessment according to the new criteria, relaxed the criteria, have produced the opposite effect: no assessment has been made, and the most damaging pesticides have become more prominent.

These organisations are pessimistic: “The chances that the European pesticide policy will have a slowing down effect on the authorisation policy in the Netherlands is perfectly possible” (Vewin 1996).

GROUND WATER QUANTITY PROBLEMS

In the Netherlands there is a precipitation surplus between August and March. In order to extend the farmers' working period, the water systems have been regionally organised to facilitate rapid discharge of the surplus in the early spring.

SALINISATION PROBLEMS

In the western and northern parts of the Netherlands, where polders and other reclaimed land are below sea level, there is a permanent saline seepage that threatens agricultural production. In order to reduce these high concentrations of salt, surface water is introduced into the polder reservoirs, mainly from the river Rhine. This solves problems of salinisation and drought in summer, but it results in a deterioration of water quality and in a pollution of the ditch soils: the process has been defined as “Rhinification” (Veen 1991).

DRYING OUT

In the higher parts of the Netherlands, more than 550 000 hectares of nature reserves, agricultural land and woodland are facing severe drying out. Of the causes of this three are related to agriculture:

– the lowering of the ground water table for agricultural purposes;
– the use of sprinklers;
– increased evaporation through higher productivity.

Two other causes, increased drinking water production and more urban land take up, are also important. The reduction of the area drying out by 25% in the year 2000, taking 1985 as a reference, is official national policy. Sprinkler installations that in a relatively inefficient way use ditch water (if available) or ground water are used for irrigation of agricultural land. However, in periods of severe drought (such as early 1996) the use of ground water for this purpose in several provinces have been periodically now forbidden (Projectteam NW4, 1995).

The actual policy is aiming at more sustainable solutions:

– ground water use will be restricted to drinking water production;
– irrigation will be reduced and will be bound by strict rules;
– the often over-sized drainage systems will be reduced; re-naturalisation of water courses has in several areas been started.

In addition to these general measures some provinces have designated specific areas with strategic ground water supplies (Veen 1991).

RIVER BANK REFORESTATION AS A NATURAL METHOD OF POLLUTION CONTROL

Lowland rivers function as a discharge basin whose river beds are higher than the surroundings. River bank reforestation as a natural method of pollution control is in this situation not applicable.

Some experiments have been carried out to use flooded fields and helophyte swamps as filters for water pollution. But since these solutions require relatively large areas and depend in their effectiveness on the growing season, the overall prospects for this solution are in the Netherlands not favourable.

In all provincial water plans the ecological management of the banks of all kinds of small water

courses has been given some attention (Veen, 1991). The policy objective is the restriction of pesticide and fertiliser use on the river banks. Environmental organisations are making strong pleas for measures aiming at the restricted application of pesticides and fertiliser on the banks of the ditches of every parcel of land (Muilerman & Matser, 1994).

SPECIFIC CONTROLS TO VERIFY THE QUALITY OF SURFACE WATER AND GROUND WATER IN AGRICULTURAL REGIONS

Since 1995 onwards the monitoring of the environment is co-ordinated by the National Institute of Public Health and Environment, that every year will publish a report on the state of the environment. Every province is divided into several regional water authorities that permanently monitor surface water quality on a great number of parameters. The same is done by drinking water producers that permanently monitor the quality of groundwater.

CO-ORDINATION WITH NEIGHBOURING COUNTRIES

The Netherlands, being situated at the delta of the Rhine, Meuse, Scheldt and Ems rivers, functions as the "sink" of North Western Europe. All emissions in upstream countries that are directly or indirectly discharged into one of these rivers, have the lowland rivers in the Netherlands as their final destination. There they are sedimented, absorbed in clay particles, in the river forelands or in underwater soils, or infiltrated into the ground water, or they just pass through and end up in the North Sea. This situation is the practical motivation for international co-operation in the Rhine Action Programme and the North Sea Action Programme (Projectteam NW4, 1995)

This water system based co-operation is duplicated at the level of provinces which organise monitoring and sanitation programmes for the tributaries of the main rivers (Veen 1991).

Because of dissimilarities with Belgium and southern European countries in pesticide policy, the illegal import of pesticides from these countries is increasing (Vewin, 1996).

ALL OTHER INTERESTING INFORMATION

Besides pesticides emissions, eutrophication and drying out, agriculture in the Netherlands plays an important role in the emission of heavy metals, especially zinc (55% of all emissions) and copper (65% of all emissions), both being added to fodder and emitted via manure (Koshiek, 1994).

Measures that have been taken to solve a specific environmental problem are often working in only one compartment of the environment and just transfer the problem from one compartment to another. The obligation for instance to inject slurry directly into the soil has indeed sharply reduced the emission of ammonia, but at the same time increased the emission of nitrates into the soil. This shift of environmental problems characterises many first instance environmental measures (Kamphuis *et al*, 1995).

Only recently the insight into so-called multi-stress effects has attracted attention. Research into the effects of combined environmental stress factors, such as the combination of several pesticides and eutrophication on the ecosystem of a ditch, has made it clear that the single factor calculations that are the basis of the existing environmental standards might underestimate the

synergetic effects of a multi-stress environment (Brock, pers. comm).

SUSTAINABLE STRATEGIES FOR THE FUTURE IN THE EVENT OF A SERIOUS SCARCITY OF WATER RESOURCES

The development of the legal system. In the third national strategy on water management (1989), the development of a single integrated law was announced but it will take until the next century before it is fully operational. The concept of integrated water management is the central starting point in this development, taking water systems as the basic units. “A water systems approach focuses on the water system (including land systems of which ground water is an essential part). By means of an integrated weighting process the approach aims at an optimal approach to society's needs regarding the functions of water systems at the possibilities of these systems by means of a set of technical and legal instruments (Projectteam NW4, 1995).

The so-called water systems approach defines the main spatial unit of integrated planning in terms of water. In regions where the surface water is the dominating system (i.e. the western, low part of the Netherlands) this is the watershed of main rivers and of secondary rivers.

In the eastern and southern part of the Netherlands these systems are defined on the basis of ground water. The national spatial planning policy document that was published in 1994 has already based the long term spatial planning for rural areas on regional watersheds. The basic principle of this planning strategy is demonstrated in fig. 1 (based on Farjon *et al*, 1991, see also Kamphuis *et al*, 1995, Beusekom *et al*, 1990).

Until now it has not been clear whether full integration at the national level would be possible. In theory full integration of spatial and environmental policy with water policy into one single environmental plan is feasible.

At present several provinces are drawing up integrated environmental plans, which at this more concrete level aim at a synthesis of spatial, environmental, ground water and surface water plans.

In this integrated planning structure at the regional level specific goals for a region can be elaborated according to its specific situation, considering for instance the regional needs of agriculture and possibilities for ground water use but also differences between regions in seriousness of problems, etc. (Veen 1991).

Sector policy: Eutrophication. In 1995, after more than ten years of intense political debate, an integral policy-plan for manure and ammonia was sent to parliament for final approvement. It includes several measures aiming at the reduction of eutrophication by the agricultural sector in the period 1995-2010. The major policy push factor behind this policy were the National Environmental Plan, the European Union Nitrate Directive and the North Sea and Rhine Action Programms (Ministerie van Landbouw, Natuurbeheer en Visserij, 1995). The ultimate goal of the manure policy is that in 2005 the difference between total gift and use by crops will not exceed 20 kg phosphate per hectare and 180 kg nitrate per hectare (Ministerie van Landbouw, Natuurbeheer en Visserij, 1995).

Farmers with more than two gross cattle units per hectare will be obliged to carry out manure accounting: every year the import and export of phosphate on the farm is carefully recorded. Surpluses of manure are heavily levied. This already has resulted in an interregional manure transport by which slurry from surplus regions is moved towards arable regions. Model exercises predict that as a result of the proposed plan on manure and ammonia policy, the discharge of nitrate into surface water can be reduced to 60% of actual figures five years after the implementation of the final standard. Due to the more complex behaviour of phosphates in soil and ground water caused by exchange between the inorganic and organic fractions, predictions on the results of the policy at a regional or national level cannot be made (Groenendijk, 1994).

This generic policy will be accompanied by specific measures at several scales. Environmental standards will be more stringent in the direct vicinity of nature reserves and drinking water producing areas (Ministerie van Landbouw, Natuurbeheer en Visserij, 1995)

PESTICIDE POLICY

In political terms the most important step to be taken is a change of scope: pesticide standards are now being formulated in terms of kg active matter, but should be formulated in terms of their environmental effect. In terms of actual environmental pressure 73% of the washing away is caused by only 5 herbicides.

The drinking water producers expect a complete solution of the pesticide problem if:

- the five most polluting pesticides are banned and soil decontamination is replaced by three years rotation;
- a reconsideration of forty suspected pesticides is being carried out followed by a ban or restriction in their use;
- the authorisation policy is based on environmental emissions;
- farmers receive better information;
- the use of pesticides is levied with a tax that depends on the environmental damage of pesticides (Vewin 1996).

In recent years much research initiated by drinking water producers and environmental organisations has been based on this environmental scope and the results of this research have been tested in the field and proven to be successful.

The remaining step towards the realisation of a pesticides policy is the introduction of modern application technology from test farms into farming practice.

SITUATION IN POLAND

INTRODUCTION

Integration of the sustainable water resources management within the regional planning policies appears to be, in Poland, a potentially more important issue than in most of the other countries of central Europe. The reason being scarcity of water, partly due to physical and climatic conditions; a situation substantially aggravated by decades of an accumulation of man-made negligence and errors in management and protection of water resources.

CURRENT SITUATION: EXISTING PROBLEMS IN THE QUALITY OF WATER RESOURCES, SPATIAL DISTRIBUTION AND AVAILABILITY

Poland is a country with relatively poor, unevenly located surface water resources. According to the 1993 assessment of the International Population and Environmental Programme (Population Action International 1993, Robert Engelman and Pamele le Ray), the average annual ratio 1600 m^3 per person places Poland in twenty-eighth position from the end of the list of one hundred analysed countries of the world.

These scarce water resources are very unevenly distributed and there is obviously an insufficient infrastructure to manage them. In the existing water reservoirs it is possible to collect only about 5% of the average annual outflow. In comparison, other European countries with similar climatic and hydrologic conditions, this rate reaches 15%. This means that during the wet years a great quantity of water irretrievably leaves Poland's territory, causing annual flood damage, while during prolonged dry periods there are shortages.

About 25% of 833 cities in Poland are suffering periodical water shortages because of insufficient quantity or quality of water sources, or inadequate or inefficient water supply installations (intakes, treatment stations, distribution networks and storage reservoirs). It is estimated that a 24-hour shortage amounts to approximately 11% of water consumptive needs, coming up to 30% in peak periods. Amongst the cities that are in danger of water shortages, most have more than 50 000 inhabitants.

In the central part of Poland, seasonal water shortages (deficits) are not limited to towns. They are also experienced by a large portion of rural water supplies. They are usually connected to a shortage of good quality ground water and difficulties in collecting expensively treated surface water. However, only relatively mild difficulties are experienced, for example, by the regional capitals of Radom, Kielce and Lublin.

Ground water aquifers in several areas of Poland seem substantial, but recognised renewable resources are relatively scarce and their localisation very unevenly spread. The richest areas in ground water are the central lowlands of Poland and the poorest are the mountain and highland regions in the south of the country. The greatest water shortages occur in the three macro-regions in Southern Poland and concern 40% of their cities. These regions are heavily industrialised. The level of seasonal water shortages in these areas ranges from 36% to 48%.

The trend of water consumption in Poland has shown an upward tendency for over four decades. Only during the last seven years of economic transition has a visible reversal of this trend been noted. Consumption of water for both industrial and communal purposes has decreased. 83.9%. of these consumptive needs are met by the surface water resources and 14.3% by ground water resources. Natural and historical conditions have determined a very high concentration of mining, urban and industrial centres in the upper areas of the Vistula (1 047 km long) and Odra (845 km of which 742 km in Poland) rivers in the southern part of the country. This concentration has brought about an important need for water in the areas with relatively small water resources. It has also caused a concentrated and heavy pollution of the upper courses of the main Polish rivers: Vistula and Odra (Oder). Starting in southern Poland this pollution crosses the whole of Poland before being dumped in the Baltic Sea.

Excessive pollution of the main rivers increases difficulties in the water supply of the central and northern parts of the country, including its capital, Warsaw. Some of this pollution comes from neighbouring states: the Odra, when entering Poland, already carries heavy pollution from the Karwin-Ostrava industrial region (Czech Republic); the Bug, the main river on the eastern frontier brings substantial pollution from Ukraine.

Water pollution by nitrates and pesticides used in agriculture, pollution from intensive rearing of cattle and insufficient rural sanitation are also to be recognised as other important problems still awaiting solutions. This ”multi source” pollution is recognised as the main cause of water pollution problems for small rural areas of central and northern Poland. It affects also the quality of ground water in many agricultural regions. With Poland constituting about 40% of arable land in the Baltic Sea basin, even with relatively low use of chemicals in Polish agriculture, this kind of pollution is recognised as a major factor in contributing to the danger of eutrophication of the Baltic Sea. A special Helcom related comprehensive international programme to combat this kind of pollution is being implemented with Poland as the leading country. It should be mentioned that Polish agriculture is overwhelmingly rain-fed and that use of water for irrigation is negligible.

WATER MANAGEMENT IN POLAND – RECENT DEVELOPMENTS IN POLICY AND IMPLEMENTATION

The above-mentioned difficulties in water resources management have brought understanding of the urgent need for radical changes in water management in Poland. The first important step in this direction was the National Environmental Policy (the NEP) drawn up by the Ministry of Environmental Protection, Natural Resources and Forestry and adopted by the Parliament in 1991.

The National Environmental Policy (NEP) stated that the new water management policy is to be accomplished through:

- water economy and sustainable resources management within the natural catchment areas with a joint, integrated approach to quality and quantity problems;

- an economic system including market mechanisms, incorporating economic instruments in order to reduce wasteful water consumption and unnecessary losses;

– rationalisation of water management introducing water saving measures, gradual technological modernisation of polluting industries, good agricultural practice limiting pollution caused by nitrates and pesticides;

– direct collaboration of water authorities with local government authorities and users;

– active bilateral, multilateral and regional co-operation, mainly with neighbouring and Baltic Sea countries;

– legal changes with new laws and regulations taking into account directives of EU and international conventions, e.g. the Helsinki Convention.

The NEP was followed by the proposal of the new Statute Law on Water, prepared by the Ministry of Environmental Protection, Natural Resources and Forestry, approved by the Government and submitted to the Parliament in 1995. This document introduces the new system of water management. In this new system the full responsibility for execution of water policy on each river-basin territory rests with the River Basin Water Authority (RZGW). The process of creating this new system has already been started. By ministerial order Poland was divided into seven river-basin areas. By decree of the Minister of Environment for each catchment area a Water Authority was established.

Each of the River Basin Water Authorities (RZGW) is supported by the (so far provisional) River Basin Council. Four RZGW were created in the Vistula Basin with seats in Katowice, Cracow, Warsaw and Gda_sk and three on the Odra (Oder) Basin with their headquarters in Wroc_aw, Pozna_ and Szczecin. To enable the new system to function immediately after adoption of the new "Statute Law on Water", it was found necessary to start preparing the Water Authorities and the Councils for the important responsibilities without waiting for the new "Statute Law on Water" to be officially proclaimed.

With the introduction of the new "Statute Law on Water", the economic system of water management in Poland will be reconstructed and based on different principles. It will be formed along the lines of a market economy, aiming at establishing a self-financing system. The funds will come from payments for water used and fees of sewage discharged in each river basin area.

Instead of fines in cases of excessive pollution, the new economic system will work through a highly progressive scale of payments for usage and pollution exceeding the licensed level. This will be accompanied by economic support to water-saving technologies, water recirculation systems and the introduction of highly effective technological solutions for waste-water treatment. It means that the policy of penalisation will be changed to the policy of creating incentives for rational water use.

Independently of the above-mentioned activities, it is planned to limit the quantities of sewage discharged by industry. The focus will be shifted from neutralising pollutants contained in waste-water, to a "pollution prevention principle" (P3) leading to reducing the discharge of toxic substances into waste water (such as heavy metals, solvents, refrigerants, used oils and chemicals). The policy aims at improving the law governing the principles of discharging waste materials into the water, promoting co-operation with industrial enterprises during the process of granting water use permits, as well as supporting and promoting activities to retrieve used chemical substances, treatment and recycling. At the same time producers of goods will be

compelled to produce more environmentally friendly products based on existing research and certification. The list of goods and services requiring certification will be extended.

The process will entail equipping the sources of pollution, particularly in the cities, but also in rural populated areas (with the waste treatment plants). Full completion of this process requires the construction of new waste treatment plants for 273 cities, with total capacity reaching 3.5 million m^3 per day, and the modernisation of 587 already existing waste treatments plants (by adding additional capacity and higher stages of pollution reduction).

It will be a formidable task as the total capacity needed for all the municipal waste treatment plants equals about 6.0 million m^3 per day. Necessity of equipping cities with the three-stage waste water treatment plants (with reduction of biogenic compounds) originates from the commitment made within the Helsinki Convention and EU instruction 91/271/EC on treating municipal waste.

In parallel, an extensive programme aimed at limiting pollution of surface and ground waters by agricultural activities, rearing of domestic animals and scattered rural populated areas is being moved from pilot project stage and expanded to several areas of Poland. It comes through integration of the former US-EPA and UNEP/WHO sponsored pilot projects into the long term HELCOM supported programme of gradual introduction and dissemination of a “good agricultural practice and rural sanitation”.

All these actions will have to be included in the basic planning document on the “Conditions for utilisation of water resources of the catchment” prepared by each Regional Water Authority (RZGW). These plans, which will have the character of legally binding, spatial “master plans”, are currently being prepared. These “water master plans” will have to be developed in full, reciprocative co-ordination with regional plans for national economy development and assure consistency with the communal development plans (so far the only regulatory, legally binding development planning tools available in the country).

Rational management of surface water resources will have to be adjusted in co-ordination with the physical, land use and development plans of the country. Decentralisation of the new water users will be accompanied by sound use of water, in particular by industry and services. Careful studies will precede any substantial new allocation of water for irrigation of arable land, which only exists so far in a very limited scale.

A very small regulatory capacity of the water management system, caused by an insufficient reservoir volume, creates problems with supply of water during summer and other dry periods in many areas of Poland. The need for a higher retention capacity in Poland is enhanced by regulations adopted to ensure an “invariable flow of water in the river-bed” (which is seen as essential for maintaining the proper hydro-biological conditions in the water ecosystems). Therefore an increase in reserves is included in all development programmes of the water sector, such as river-side reforestation and small scale water storage programme.

The functional base for activities in this sphere is being prepared under the "Development of small retention programmes". These programmes, processed by the Voivodes in co-operation with RZGW, will embrace both re-structuring and renovation of devastated retention facilities, and also realise entirely new undertakings. Along with the development of the other sections of the water economy, the development of small-scale water power plants are also anticipated. All these activities will be of significant assistance in the shaping of a comprehensive, nature friendly and sustainable model of water management.

The "Settlement on Associating Poland to the European Union" was implemented on 1 February 1994. It stipulates adjusting Polish ecological law in accordance with EU law. In accordance with the settlement, the process of law harmonisation is expected to be completed within ten years. The new Statute Law on Water takes in basic principles of use and protection of surface waters approved in the legal acts of the EU, and introduces statutory regulations of harmonisation under the specific instructions of the EU.

In parallel to these activities, Poland continues to develop special agreements on water management and water quality protection with all of its seven "formally new" neighbouring states ("formally new" as all those states did not exist ten years ago). The most spectacular achievement in this area is the formation this year in Wroclaw (Poland) of the International Odra (Oder) River Protection Commission with the participation of the Czech Republic, Germany, Poland and the European Union.

APPROACH FOR THE FUTURE IN THE EVENT OF AN INCREASED SCARCITY OF WATER RESOURCES DESPITE THE ABOVE-MENTIONED MEASURES

Despite all the above-mentioned extensive measures undertaken by the Polish Government to introduce a new water management system, it is quite possible that the difficulties in the provision of water where and when it is needed will remain or even increase. A comprehensive, sustainable water management system cannot be fully implemented by acting only within the system.

The implementation of a truly balanced and sustainable water management system requires constant interaction with regional planners. The environmental conditions of Poland determine that difficulties in supplying water cannot be solved solely by actions on the supply side of the water balance. These actions need to be supplemented by reducing and redirecting the needs of water consumption in areas of shortage.

This can be done only through the gradual, long-lasting process of an appropriate spatial adjustment of development. So far co-ordination between the water management sector and regional planning has been insufficient: both the legal system and the organisational set-up have a tendency to function in parallel. Cases of working together and reciprocative cooperation are still relatively rare.

Evidence of increased understanding has been noticed at the decision-making level, which warrants our optimistic conclusion: time has come to introduce a working water management programme and put development planning cooperation into practice. This would lead to an ultimate success.

3.2. *Industry*

SITUATION IN FRANCE

Water has always been essential for economic development. Since the earliest days of industry, people have located villages, towns and economic activities beside rivers and lakes. Water has served to transport raw materials and finished products and has supplied the necessary energy to turbines and mills, for the manufacture of paper, thread, textiles and so on.

At the beginning of the industrial age, the introduction of hydro-electricity to the French valleys of the Alps, the Pyrenees and the Massif Central meant the development of lighting, metallurgy, chemistry and public transport.

LEARNING TO MANAGE A LIMITED RESOURCE

Several decades later, people in France and elsewhere realised that the careless use of water for industrial purposes caused pollution and that the aquatic environment, particularly its fauna, suffered the consequences – which also indirectly affected the human population.

Much later – indeed not until the 1980s – people also realised that natural freshwater reserves were not unlimited, even in France, and that comprehensive water management strategies needed to be learned.

Although industries use much less water than does the agricultural sector, the Environment Ministry's water division has for some years been focusing attention on the conservation of resources by French industry. Without implementing a coercive policy in the area, since it does not regard the problem as particularly urgent, the water authorities have managed to inculcate new attitudes to water use by industry. This approach has three main emphases:

– resources must be conserved by preventive action and pollution of all kinds must be avoided at source;

– manufacturing processes which avoid squandering water must be researched and implemented, e.g. closed cooling circuits which continuously recycle the same quantity by condensation;

– sources must be resupplied with recycled waste water in optimal conditions.

French water specialists in the Ministry of the Environment and the various catchment basin agencies alike agree that industry is not primarily responsible for current threats to water resources. It may have jeopardised the existence of certain freshwater sources in the past, but not the resource as a whole.

Of course, this is no reason to tolerate waste; it is now generally acknowledged that water is a limited vital resource. Treating polluted water is costly, however, and constitutes a significant proportion of the cost price of products whose manufacture requires freshwater. Manufacturers therefore seek to decrease water consumption in order to reduce the amount they have to treat. Although the state has not had to impose regulations on manufacturers, sectors such as the steel and paper industries are today very proud of their achievements in controlling the water

quantities used in their manufacturing processes.

WATER USE BY INDUSTRY IS RELATIVELY MODEST

The whole of metropolitan France, which covers an area of 550 000 km^2, is situated in a temperate zone and thus experiences considerable rainfall – an average of 440 billion m^3 per year. Evapo-transpiration and unusable floodwater account for 300 billion m^3 of this quantity, leaving 120-150 billion m^3 per year in addition to the 1 000 billion m^3 already present as groundwater. One hundred billion m^3 of water are available for human use (60 billion in a very dry year) before there is any danger of depleting permanent reserves.

Total water extraction averages 37.7 billion m^3 per year, of which 4.4 billion is used by industries not connected to a system (11.8% of total) and 22.3 billion by power plants (59% of total). The bulk of the water extracted goes back into the natural circuit. The difference between the volume extracted and the volume restituted gives the consumption (chiefly by evaporation) and accounts for 0.4 billion m^3 in industry, i.e. 7% of total consumption, while approximately the same amount is used up by power plants.

These figures were issued by the French Ministry of the Environment and are valid for November 1994.

DECENTRALISED POLICIES ADAPTED TO REGIONAL FEATURES

The government has a standard water policy for the whole country. Information on the industrial use of water gives no cause for alarm; indeed, water consumption by industry has a tendency to decrease, since manufacturers themselves have realised that production units that use water sparingly cost less than those that waste it.

It is also worth pointing out here that domestic consumption too has a tendency to decrease. Like agricultural consumption, it accounts for approximately 40% of total consumption; the farming sector, however, uses more water from year to year with the increase in irrigation and spraying.

The individual public water authorities, on the other hand, are responsible for an entire river basin on catchment area whose specific features and users are well known to them; these agencies can issue guidelines and make subsidies available which encourage users to be more economical, respect resources and exercise individual responsibility.

The six water agencies in France (Adour-Garonne, Artois-Picardy, Loire-Brittany, Rhine-Meuse, Rhone-Mediterranean-Corsica and Seine-Normandy) thus take individual measures but also common ones, even without formal consultation taking place between them.

INITIATIVES BY THE SEINE-NORMANDY AGENCY

The Seine-Normandy water agency covers the entire catchment area of the Seine from the Champagne region to the sea, as well as the two parts of Normandy which have numerous small rivers along their coasts.

In 1994 (the 1995 activity report was not available at the time of writing), this agency continued to subsidise environmentally benign technology, the recycling of effluent and the prevention of accidental pollution. It carried out prospective studies, in particular on the spraying of fertilisers by agro-food industries, water purification costs for the paper manufacturing industry and environmentally benign technology for surface treatment.

Aid allocated for investment in depollution totals 403 million francs divided among 429 recipients, e.g. the collection and treatment of polluted water from Orly airport and environment-friendly technology in the milk sector and internal measures designed to reduce pollution at source.

A large part of the aid allocated to industry is for waste treatment. The agency helps industries to eliminate their waste in officially approved recycling centres which provide all the necessary facilities for effective treatment. This plays an important role in preventing groundwater pollution by seepage from unauthorised polluters.

In the area of incentives and raising environmental awareness, water agencies in general and the Seine-Normandy Agency in particular implement a wide range of measures: symposium for the extraction industries on the environmental impact of mining and quarrying; the publication of works on pollution control and techniques of partially or totally closed water circuits in factories; a study on water pollution control in the oil industry; a seminar on water rationalisation in industrial processes, and a competition to encourage municipal authorities and industries to improve the performance of their treatment plant (eleven undertakings received awards in 1994).

THE EFFORTS OF THE RHINE-MEUSE AGENCY TO ECONOMISE RESOURCES

French industry has a tradition of wasting water, no doubt owing to its general abundance. In a report on the subject, the Rhine-Meuse Agency notes that in the 1960s it was not unusual for textile industries to consume 50 m^3 of water per tonne of dyed material, or for paper mills to use 200 m^3 water per tonne of paper manufactured.

The growth of the economy and improved sanitation in towns quickly showed the limits of water resources. Quality has seriously decreased in some areas, to the point where water cannot be used. There are instances where manufacturers situated along the same watercourse have to arrange their discharge and extraction times in order to get clean water. Such juggling acts eventually compel users to save water.

The Rhine-Meuse Agency has devoted great effort to the subject by providing regular thorough training for manufacturers to help them reduce consumption in order to reduce pollution and improve recycling. Reducing the quantities used also means better control of accidental pollution because it is easier to eliminate or provisionally store a concentrated product than a diluted one.

From 1981 to 1990, industrial water extraction decreased by 20% in the basin as a whole and stabilised at approximately 1 000 million m^3 per year. Restructuring in the iron and steel industry – traditionally a large water consumer – accounts to a large extent for this, but savings made by other industries in the area as a result of agency incentives also contributed.

THE PROBLEM REMAINS UNSOLVED IN THE LOIRE-ATLANTIQUE

Without being over-pessimistic, it must be recognised that water conservation policies in industry can scarcely come from sources other than the state, basin agencies and local authorities. As already noted, the matter is not among the Environment Ministry's priorities and agencies tend to encourage rather than compel. The following example shows that local or regional authorities are sometimes impotent in the matter.

In 1993, the Loire-Atlantic Regional Council commissioned a study on freshwater supply to industries on the banks of the Loire estuary. As in all estuaries, seawater mingles with freshwater from upstream and in different places at different times according to the tide. Industries which use freshwater thus have insuperable difficulty in obtaining supplies directly from the river estuary.

It was suggested that industries obtain their supplies from the drinking water system, but for the local authority it was unthinkable to purify water ultimately destined for industrial use, while for industrialists the cost was simply prohibitive.

The question, then, was how to solve this problem, but no concrete proposal was made and hence no solution was implemented. The problem is still unsolved.

It should, of course, be pointed out once again that this particular example of a local problem may indeed be symptomatic, but there is no evidence that it is representative of the general situation of industrial water use in France. Such a brief study of the matter cannot claim to be exhaustive or statistically and scientifically exact, particularly as there are no statistics which would have allowed more thorough treatment of the subject.

THE SPECIFIC CASE OF ELECTRICITE DE FRANCE (EDF), WATER USER AND MANAGER

Electricité de France (EDF) is an industry, but as a water consumer it is unique and is treated separately in all texts on the subject. There are many reasons for this: it is a utility public company; it still has the *de facto* monopoly on electricity supply, the product it sells enables most other private and economic activities to function; it is the largest industrial user of freshwater and not only uses water for its own needs but also manages it in considerable quantities. EDF is thus a special case which should be treated apart.

EDF plants do entail risks for their aquatic environments: pollution by dams, discharges from power plants, etc. In France, power plants alone account for 59% of water consumption and consume, mainly by evaporation, the same amount as the rest of French industry put together (7% of total consumption) which is a substantial amount, but must be considered in relative terms as demonstrated above.

Dams obviously have a significant impact on fish. Thermal power plants, as well as nuclear plants, heat water either to produce steam or to cool the reactors; discharge of this water after use can increase the temperature of the immediate aquatic environment by several degrees. However, none of this jeopardises the water supply itself, or only to a very small extent. Moreover, EDF carries out an impact study on each of its projects and is also carrying out a one-year hydrobiological study.

EDF has even become one of the most important managers of France's water resources, water management being an essential part of meeting electricity consumption needs. EDF has a total storage capacity of 6-7 billion m^3 – three quarters of the total national capacity.

EDF has made its know-how regarding water resources (e.g. rain, snow and flow measurement) and storage (e.g. construction and operation of reservoirs and dams) available to various partners requiring water for other uses and for the construction of multiple-purpose facilities: Durance (electricity and irrigation), Rhine (electricity and navigation), etc.

Together with the public authorities, EDF is studying possibilities of improving water resource management with a view to meeting community needs: setting up new reserves, improving existing dams, making current management more efficient, and so on.

To recapitulate, no single entity in France has overall responsibility for conserving freshwater resources for industrial use. The Environment Ministry has other concerns and there is no formal dialogue between water agencies to ensure consistent policies among basins, although technically these agencies assume most of the responsibility. Three quarters of available resources are managed by an electricity company whose primary function is not that of water management and which will undoubtedly have to face competition on the market in the near future.

It would thus seem that overall national responsibility or greater motivation by the state is required for the conservation of freshwater resources in industrial use. It would also seem essential that the state maintain control over the hydraulic resources represented by dams, whether or not this control is exercised through a public company such as EDF. It would place the environment at serious risk if EDF were to be faced with competition and/or privatisation and if the authorities were to lose control of all or part of the reserves which the national electricity company has put in place.

SITUATION IN GERMANY

CONDITION OF FRESHWATER

According to the national and Lands governments considerable successes have been achieved; in fact, the quality of German rivers and lakes has improved markedly in recent years (Bundesministerium für Ernährung *et al*, 1996). The quality of many of the rivers in Germany's old federal Lands has again attained Class II status (moderately polluted). Rivers of which some sections are more strongly polluted than this are predominantly smaller waterways, e.g. the Emscher in the Ruhr District, which was allocated the function of a sewage canal by policy makers in the late 19th century (in order to maintain other rivers as freshwater resources for industry and the population).[11] The main cause for the changes in freshwater quality is officially quoted as being the improved treatment of sewage in towns, municipalities and industry.

Improvements in the treatment of industrial sewage are actually due to the interaction of various factors:

– regulatory discharge consents;
– state levies acting as an economic incentive for improvements in effluent management;
– environmental pressure from non-governmental bodies;
– modernisation of industrial plants and other structural changes after the unification of West and East Germany.

PRIORITY EVALUATION OF DIRECT EMISSION IN ISSUING DISCHARGE CONSENTS

In order to further improve the condition of surface water (including the North and Baltic Seas), there are demands in Germany for precautionary measures in the treatment of sewage. Here one should emphasise:

– commitment to a more intensive purification of sewage to reduce levels of the nutrients nitrogen and phosphorous, also in industrial effluents;
– the requirement to purify sewage containing so-called hazardous substances to the highest level possible using the latest technology.

In Germany, the emission principle applies. For this reason, the regional authorities can insist on a company purifying its sewage, regardless of whether undesirable effects really do occur or are to be expected when this matter is discharged into the actual lakes and rivers. The water authority responsible for issuing discharge consents do not have to provide proof of the actual risk potential anticipated for the river in question. It is far more a case of quoting national emission norms, specified according to the branch of industry in over fifty sewage-management regulations.

Aspects of sewage hygiene have so far played no part in the way authorities grant industrial discharge consents – despite the possibility of regional problems with the quality of the rivers

11. By contrast, pollution of rivers with dirt and contaminants in the new federal Lands is altogether higher. The task of improving their quality has been granted priority status up until the year 2000.

as bathing areas (e.g. in the Berlin district). Short-time sterilisations are required in the case of sewage from biotechnical production entailing genetically recombined organisms.

The German water law stresses the possibility of drawing up regional plans for sanitation and regionally co-ordinated management for rivers. Management plans of this nature were only put forward in a few cases, e.g. the upper Kocher in Baden-Württemberg (cf. Regierungspräsidium Stuttgart, 1986). The high expectation parliament placed in them did not prove justified. But there again, the standard regulations according to the emission principle have hindered the emergence of water-quality management in regional planning policy.

This situation could well change in future, since it has become clear in recent years that even using the latest technology, this does not prevent toxic effects from occurring in rivers or certain types of freshwater utilisation from being impaired, e.g. water supply or fisheries. Namely, hazardous substances in the sense of the German law concerning water are, by definition, only a small selection of the vast quantity of substances discharged by companies into the rivers and which can, indeed, lead to damage there. Furthermore, the circumstances surrounding each river, for example population density, degree of industrialisation and flow quantity may lead to further damage. Besides, surface waters are also polluted not only by industrial or communal point emissions but also by the diffuse emission of contaminants such as atmospheric entries from industry or substances running off agricultural fields. Occasionally then, immission considerations relating to the special situation in specific river catchment areas emerge alongside the emission-related consideration. A schematic assessment scale may be used to set appropriate quality objectives; either all or just some of the parameters apply, depending on the types and extent of the river's utilisation; an appropriate procedure was initially recommended for the Rhine (cf. International Commission for the Protection of the Rhine 1995); the 45th German Conference of Environment Ministers recommended the inclusion of this procedure in water management regulations.

SEWAGE LEVY AS A CONTROL INSTRUMENT

Regulatory consents for the sewage discharged into rivers have been subject to levies since 1981. Thus the polluter must pay, but only for certain sewage (heavy metals, absorbable organically bound halogens, oxygen-demanding substances and those toxic to fish). For each “contaminant unit”, money has to be paid to the regional authorities, at successively increasing rates (from 1.1.97 DM 70). The sewage levies have tended to lead to those branches of metalprocessing involving a particularly high incidence of heavy metals to switch to sewage-free procedures, i.e. the water used for production is reused in a closed cycle. A second example are paper manufacture where waste water used to have high oxygen demand as well as high absorbable organically bound halogens. In this branch, the sewage levy has promoted the re-use in cascades and a tendency to switch to production-water cycles (cf. Vack/Schramm, 1995).

Basically speaking, the sewage levy brings about the avoidance or reduction of sewage, registered as containing the “contaminant units”.[12] Regrettably, the federal legislator has planned a reduction in levy rates as of 1999 which means that the regulatory effect will

12. To date, for example, there have been no moves on the part of government to create standard regulations for sulfonates and other substances form industrial discharges which are relevant to drinking water but not hazardous substances as specified by the water law. Cf. also Lindner *et al*, (1996) on this issue.

diminish and that an extensive economic internalisation of the pollution will not be attained.

FURTHER IMPORTANT ASPECTS

Plans for thermal load, drawn up between 1971 and 1982 for some of the larger rivers, help promote the use of water cycles, particularly in cases where cooling water is used in the generation of electricity and in the chemical industry. This illustrates, for example, the difference between the main BASF AG plant in Ludwigshafen on the river Rhine, where flow cooling is customary, and the main Hoechst AG plant in Frankfurt on the river Main which has to operate using coolant cycles: during the summer months, the river Main with its far smaller volume of water can only accommodate a relatively small quantity of heat.

Plans for maximum thermal load had been worked out for the catchment area of single rivers twenty years ago; tributaries of the Rhine as Main or Neckar often have plans of there own. The existing plans for thermal load are in need of revision, since the maximum temperatures that they cite as critical values actually may cause damage to the rivers' ecosystems (cf. Lozan *et al*, 1996: 100 ff). A revision of the thermal load plans would lead to industry based throughout most or even all German river systems resorting more heavily to coolant cycles.

In-house intensification of water utilisation (e.g. use of circuits) can also be achieved via levies on groundwater extraction. A large number of federal Lands have prescribed corresponding levies (some, such as Baden-Württemberg, on river water too); the charges vary considerably from Land to Land and will therefore lead to regional differences in industrial water utilisation. Unfortunately, regional development planning in the single Lands played no role in the fixing of the levy amounts; this means that levies in parts of the Land suffering from water shortages are just the same as in those with plenty of water.

INTERNATIONAL AGREEMENTS

The International Commission for the Protection of the Rhine, in which France, Germany, Luxembourg, the Netherlands and Switzerland have been working together for forty years is an example of effective international river-protection policy making. This procedure is thus also chosen in managing other rivers that Germany shares with other countries: the agreement between Germany and the Czech Republic leading to the International Commission for the Protection of the Elbe forms the basis for closer co-operation within the catchment area of this river. Following the preparation of an immediate programme, a longer-term action programme was then ratified. In addition there is the contract for the International Commission for the Protection of the Oder (1996) and an agreement for the protection and tolerable exploitation of the Donau (1994). Although negotiations are underway for a German-Dutch agreement for co-operation on river and environment protection in the Ems-Dollart estuary, they seem to exclude the main catchment area of the river Ems and be confined to the estuary.

There are only sporadic signs of international co-operation in the field of water quantity policy; the management of deep groundwaters in the brown-coal district Lausitz, for instance, comes under the German-Polish Border Waterways Commission. A similar procedure is lacking in the case of the exploitation of the aquifers in the lignite district on the left-bank of the Rhine, despite the existence there of an “Euroregio” and despite estimated 200 years effects for groundwater and long term effects for the land-water ecotone in the Schwalm-Nette-conservation area.

SUGGESTIONS

The debate as to which form of water management is conducive to sustainable development has not yet drawn any final conclusions, neither in Germany nor in Europe:

– on the one hand, there is the view that in managing resources it is sufficient to consider the economic, social and ecological aspects; however, in some cases this can lead to ecological claims (such as the principle of precaution or even the causation principle) being qualified;

– on the other hand, water is seen not merely as a resource, but also in its ecological context within the water cycle and bodies of water (biotope), and as a cultural asset. Furthermore, it is deemed necessary to broaden the options for future generations' acting.

The first position merely gives rise to minor modifications of current practice; the second necessitates a radical transformation of water policy regulations and institutions. It would result in strategies which are a considerable departure from those representing official policy (cf. parts of Kluge *et al*, 1995).

In Germany, various parties involved in making water policy are calling for regional sustainability; they emphasise the significance of the regionally endogenous groundwater supplies and draw attention to their priority extraction for public water supply (industry would then be obliged to fall back on river water; depending on the geographical circumstances, pipelines for industrial water would have to be laid from the rivers). In terms of regional sustainability, it would seem impractical to view large river catchment areas as regional units in themselves (as is partially the case in Germany). Smaller regions need to be formed; this requires a new, functional interpretation of the region to be developed, based on existing utilisation in the area.

In future, regionally sustainable freshwater management can not confine itself to focus water only, since in sewage, water and substances are mixed together; sewage treatment may lead to improvements in the quality of freshwater, but also means that the discharged substances (in the form of sludge, for example) end up in the air or soil (within the region itself or – via waste trade – outside it). Up until now, the water authorities have not been examining whether the incidence of sewage in a company can be reduced. The plants requiring consents as stipulated by the immission protection law should be operated according to paragraph 5 which states that waste should be avoided or re-utilised; in exceptional cases only is the disposal thereof permitted. The state, therefore, could make its consent of the disposal or treatment of sewage from plants of this kind dependent on far stricter, even regionalised, requirements than is the case today.

SITUATION IN ENGLAND AND WALES

INTRODUCTION

The sustainable management of water can be linked to the town and country planning process at many levels in England and Wales including the regional level. The integration is complex as the inclusion of water management issues in regional planning policies can only relate to land use planning matters but by influencing the process the management of water in a sustainable manner can be promoted.

This papers considers regional planning policies and the links with development plans and development control in England and Wales; the potential inclusion of water management in policies is outlined; and the issues of pollution prevention and control and the availability of water resources are highlighted as areas of particular importance. Throughout the debate, sustainability in relation to the different aspects of water management are highlighted and linked back to regional planning guidance to indicate that a positive proactive approach is possible.

Regional planning policies for England and Wales can be considered somewhat in isolation due to the fact that catchments managed by more than one country are not of consequence. In the situation where the management of water catchments falls across more than one region information, data and advice is given from the Environment Agency, responsible for water management in England and Wales and can be extrapolated to aid the planning in adjacent regions.

Whilst considering the links between regional planning guidance and integrated water management in relation to industry and industrial development it is important to reflect that the issues of importance in water management can often apply to many different types of development whether residential, retail or commercial.

REGIONAL PLANNING POLICY

Regional planning guidance in England and Wales is issued by the Secretaries of State for the Environment and Wales respectively. It complements the planning policy guidance on particular topics, giving the spatial strategic element to the guidance interpreting it for a region. In this case PPG23 Planning and Pollution Control is of great importance as it gives guidance on the relevance of pollution controls to planning functions. In England the regions covered by regional planning guidance are Tyne and Wear, West Yorkshire, London, Greater Manchester; South Yorkshire, East Anglia, the North, East Midlands, South East, South West, West Midlands, North West and Wales are dealt with separately. Regional planning guidance is prepared by regional government offices involving liaison and consultation with interested parties.

Regional planning guidance promotes a strategy for a region and establishes a planning framework for various elements such as urban regeneration, tourism, and minerals to guide planners and developers towards a comprehensive approach for the region. The integrated management of water can be included at this regional level within sections on quality of the environment and to some extent provision of infrastructure. Sections on water and flooding have been included in more recent guidance for regions in England.

Regional planning guidance sets the framework for development plans produced by local authorities in that region and is used by planners in preparing their structure plans or unitary development plans, part I. Under the Town and Country Planning Act of 1990 decisions on development proposals should be made in accordance with the development plan unless material considerations indicate otherwise (Section 54A). Development plans in turn should reflect planning policy guidance and regional planning guidance. It therefore stands to reason that if water management issues can be incorporated into regional planning guidance at the strategic level, then echoed and detailed in development plans, development proposals which are unsustainable or detrimental to the environment can be prevented.

The United Kingdom sustainable development strategy emphasises that the protection and enhancement of our surroundings should go hand in hand with a healthy economy. The Government's guidance to the Environment Agency on Sustainable Development, 1995, advises that in considering development the Agency should seek to take properly into account any longer term implications and effects, particularly those which appear likely to be irreversible, reversible only at high expense over a long period of time or which would raise issues of inequity between generations. It is important to note that the guidance mentions land use planning as a vehicle for achieving sustainable development.

Various elements of water management can be reflected in regional planning guidance when relating them to land use planning. In particular the prevention of water pollution and the availability of water resources. These issues will be considered in turn.

POLLUTION CONTROL AND PREVENTION

The Environment Agency is responsible in England and Wales for guarding the precious resource of water, it has a responsibility for preserving and improving the quality of rivers, estuaries and coastal waters through its pollution control powers, and to conserve and secure proper use of water resources.

Consents for discharges to controlled waters may be issued by the Environment Agency and the dischargers have to pay for the activity. It is an offence to discharge effluent without the consent of the Environment Agency in all but the most exceptional circumstances and the “polluter pays” principle is adopted.

The Environment Agency's recent publication, “Water pollution incidents in England and Wales 1995” shows that during 1995 the number of pollution incidents reported to the NRA, which was the predecessor body to the Environment Agency responsible for water pollution control, were 35 891 with 23 463 later substantiated. Of these 4 763 pollution incidents were from industrial sources, that is 20% of the total. When these industrial incidents are broken down it can be found that the single biggest source is from the construction industry with chemical, food, mining and engineering industries also having high contributions.

When pollution incidents of any type are reported, they have to be investigated properly and in some cases the source of pollution is readily found, but in other situations lengthy investigations are required. When a pollution incident has been confirmed, necessary steps are taken to minimise impact, trace the source, prevent further discharge and collect evidence for any resulting legal action.

In the past it was the National Rivers Authority's policy to prosecute major (Category 1) pollution incidents where there was adequate evidence to support the case. However it is not always possible if the source cannot be traced or the incident is the result of actions by persons unknown. The courts can then impose a range of fines, the maximum available in the Magistrates Court under Section 85 (6) of the Water Resources Act 1991 remains at £20 000 but there is no limit to the fines from the Crown Court. In this way a strategy of “Polluter Pays” is imposed. For less severe pollution incidents formal cautions or warning letters where appropriate are used.

The Environment Act 1995 has extended the powers available under Section 161 to allow the Environment Agency to severe notice on any person responsible for a facility where there is a serious threat of pollution, specifying the actions to be undertaken and the timescale. This will help to promote the Agency's pollution prevention activities.

All industrial sites pose a potential threat to our natural water environment. Spillages occur everyday sometimes devastating the wildlife habitats, killing fish and invertebrates associated with surface waters. Much can be improved by prevention measures, establishing good working practices with industry and providing training to explain how water pollution can be avoided. However even more can be done by locating industrial development away from the most sensitive areas and this is when strong links with the planning process can help. This is especially true when considering the protection of groundwater.

GROUNDWATER PROTECTION

In 1992 the NRA published a policy document “Policy and practice for the protection of groundwater” which established a technical framework for groundwater protection, recognising the need for the management and protection of groundwater on a sustainable basis. It identified three groundwater source protection zones varying from vulnerability to contamination.

Development and the use of land is the one consistent element in the list of potential threats to the quality of groundwater. Groundwater resources are not visible and therefore are often ignored. The risk of contamination varies depending on the type of activity proposed and the vulnerability of the groundwater to pollution from the surface. The Environment Agency has a duty to maintain and protect the quality and yield of groundwater resources for abstracted and indirect uses. It does this through its own powers but also in consultation with other regulatory agencies. Regional planning guidance provides an obvious mechanism to highlight the need to protect groundwater. The guidance can direct Local Authorities to address the issues in their development plan policies, encouraging development outside source protection zones and off major aquifers in accordance with the “Policy and practice for the protection of groundwater”.

WATER RESOURCES

Another major issue of water management which can be highlighted in regional planning guidance is that of the availability of water resources. The NRA, and now the Environment Agency, is working on the establishment of an environmentally sustainable water resources strategy.

The National Rivers Authority produced a strategy in 1994 entitled “Water nature's precious resource, an environmentally sustainable water resources development strategy for England and Wales” which aims to ensure that the legitimate needs for abstraction of water are met in a way which is environmentally sustainable.

The Environment Agency has to recognise its role in achieving sustainable development and this implies that there should be no long-term systematic deterioration in the water environment due to water resource development and water use. A concept key to the strategy is the management of water use by measures to control waste and consumption. In the past it has generally been the practice to develop new resources to keep ahead of the rise in demand. Now, however, it is considered more appropriate to identify what steps can be taken to control demand and therefore to see if new proposals are really necessary. Emerging from the 1994 strategy were some key messages which included the possibility that demand can be managed to avoid the requirement for large scale water resources developments over the next twenty years; water use efficiency in industry, commerce, agriculture and the home; environmental considerations will be crucial; and the early planning of major resource developments is required.

There is still much work to be done, the 1994 strategy was the starting block from which improvements could be built upon to help ensure secure water supplies and an improved water environment. However, to achieve this the Environment Agency can be helped by other organisations, Local Authorities and industry as well as the water companies. Clearly planning guidance can play a major, important role. Recognition that large development proposals, including industrial developments may require increased water supplies is a first step. Planning guidance cannot solve all the problems associated with the availability of water resources but can help to decrease the rate for future demand.

Regional planning guidance can indicate to local authorities preparing their development plans that development should not exceed capacities of existing or planned infrastructure, which includes the necessary provision of water supply. Regional planning guidance can also highlight potential shortfalls in water supplies, in situations where it can be forecast, and relate them to the need to take measures to manage demand and increase the efficiency of water use.

THE WAY FORWARD – INTEGRATION WITH REGIONAL PLANNING POLICIES

When these issues are incorporated into Regional planning guidance and effectively cascaded into policies in development plans, the strategies and work being undertaken alongside the planning system can have an influence at all levels. When the path is made available through these routes and issues such as pollution prevention and availability of water resources are consistently incorporated into regional planning guidance, assessment of individual development sites should become simpler with the strategic direction clear. This has to be of benefit to the environment as a whole and will improve the possibility of achieving sustainable development. It also aids the potential developer whether a large commercial firm or small industry as they can be made aware of the regional, strategic situation at the outset when they are forming their ideas for a new development. By understanding the issues at an early stage they are able to avoid channelling resources into proposals which will be detrimental to the environment.

Within England and Wales the issues outlined above direct the argument towards one route, that of co-operation and partnership. It is to the benefit of the environment that local authorities and the Environment Agency work together to guide development in the future to the least sensitive areas to avoid irreversible damage to the environment, therefore promoting sustainable development. In order to do this the Environment Agency will have to encourage its positive and proactive approach towards liaison and exchange of information with the regional government offices who draft the regional planning guidance. Consultation at the earliest possible stage is imperative and co-operation between organisations is extremely important if these issues are to be recognised and given due regard as a strategy to promote and achieve sustainable development.

3.3. Domestic consumption

SITUATION IN AUSTRIA

Austria disposes of rich water resources and of a public water supply of a high standard. Great emphasis is placed on the maintenance of the water resources which are already utilised and of those not yet utilised, whereby the principle of an overall protection of ground water is applied.

Ground water is to be protected from contamination; where the water is already polluted, it is to be upgraded, which means that further pollution discharge is to be reduced or eliminated.

Moreover, different usages exert great pressure particularly on the areas with water resources of high quality and thus it is necessary to give high priority to the protection of these resources.

In various legal fields there are normative instruments, but also economical instruments to achieve the aims mentioned. In many cases these instruments are sectoral and strictly limited to special topics.

Furthermore, these topics aim at harmonising all areas and at summarising them with the participation of the public.

INTRODUCTION

WATER RESOURCES AND WATER SUPPLY IN AUSTRIA

In Austria, the public water supply is provided by public water authorities, associations and co-operatives in accordance with the Federal Act on Water, as well as by private companies. To-day, about 85% of the Austrian population are linked to the central water supply. Due to the Austrian population spread, which is characterised by a high share of scattered inhabited areas, a considerable rise of this quota is not expected.

As to the water quantities, the situation in Austria, related to the whole of its territory, is very favourable. Precipitation, however, varies greatly from 2 500 mm per annum in the West to 500 mm per annum in the East of Austria.

Water consumption in Austria can be divided as follows:

– drinking water supply: 790 million m^3 per annum;

– irrigation (agriculture): 200 million m^3 per annum;

– industry:1400 million m^3 per annum (of which about 900 million m^3 per annum cooling water from surface waters).

About 99% of drinking water is provided equally by ground water and springs. Only about 1% of the drinking water is derived from surface water, i.e. from the few reservoirs built for this purpose.

The amount of water which each Austrian consumes via the central water supply is about 150 litres per person per day. If the various companies which are also supplied by the central water supply also taken into account, the volume amounts to approximately 260 litres per person per day. These values have remained constant for many years; this is not least to be attributed to the consistent elimination of losses of water in the supply system and in households.

The main water resources in Austria are to be found in the carstic regions (e.g. Hochschwab, Schneeberg, Rax, Schneealpe, Untersberg, Karwendel, Dobratsch) and in the valleys and basins with mainly quarternary sediments.

PROBLEMS

In contrast to this generally very advantageous scenario, particularly in the Eastern parts of Austria, there are regions which are deficient in water. The supply of which, however, due to natural conditions, is not difficult to achieve within the framework of supraregional solutions; in the past, this supply was largely extended.

How far solutions of this kind are possible at present and will be possible in the future, from the political point of view, remains to be seen.

While Austria's situation with regard to the water quantity is, one might call, unproblematic, as a whole, in some parts of Austria there are problems with the quality of the water. This is due to contamination by chlorinated solvents, nitrate and plant protective agents.

Monitoring

For the elements of the hydrological cycle, as well as for the quality of the water there are complex monitoring programmes for ground water and rivers.

For over 100 years, the Hydrological Service has been carrying out monitoring and measurements of the elements of the hydrological cycle such as precipitation, evaporation, ground and spring water. In this context, the data of about 3 000 measuring points on ground water and of 670 discharge measuring points on rivers are published periodically.

In 1990, the legal and financial basis for a uniform and systematic ground water monitoring system for Austria was formed. A comprehensive monitoring programme with about 2 000 sampling points registers the quality of the ground water. The quality of rivers is monitored at 250 sampling points.

Aims of regional planning

The protection and the extraction of drinking water in most cases directly competes with other kinds of utilisation; e.g. it is used for settlements, transport, industry, agriculture, etc. Today one of the most responsible tasks in water management and regional planning strategies is to find a reasonable and just equilibrium for the future.

The following aims arise from the situation of water resources management mentioned above:

– safeguard of the quantity and quality of water resources;

– coordination of land use by the public sector and, as far as possible, influencing the use of areas by private persons;

– harmonisation of water resources and water demand for present consumption and in future planning.

Constitutional situation

Austria is a federal state, i.e. the constitution provides a separation of federal government and the provinces. The regional planning mentioned here, namely the determination or limitation of certain land usages is complex from the point of view of the competence.

With regard to the overall planning of an area, its development (particularly for settling purposes and industry) and for the maintenance of areas which are not to be built-up, the legislation and executive power lies within the competence of the provinces. As to measures which have to be taken in the field of railways, mining, forestry and law relating to water they are reserved for the legislative, or possibly, the executive power of the federal government.

The matters remaining within the competence of the provinces are determined by the single Federal Regional Planning Acts of the Provinces. They are structured quite differently and have different planning instruments. For the co-ordination of the regional planning of the provinces and of the federal government, the *Österreichische Raumordnungskonferenz* (ÖROK) was established as early as 1971.

Instruments of sectoral planning

EXPLORATION OF RESOURCES

In comprehensive and expensive programmes the essential water resources (ground water, carstic water) are explored hydrogeologically. This is done by the provinces themselves and also within the framework of co-operation programmes between the federal government and the provinces. In the latter case, costs are shared. The result of these explorations is planning without legal obligation. In fact, already the existence of a documented knowledge of water resources can influence planning in favour of water resources management.

CONCEPTS FOR WATER SUPPLY

These are guidelines of the provinces for planning activities in their administration. The concepts are based on explorations of the resources and highlight the necessary measures to be taken. It has proved to be very useful to present the results of the periodical reports at the parliament level of the province in order to guarantee a certain binding character in this respect.

AREAS OF PROTECTION

For the protection of the drinking water supply, the Federal Law on Water provides the establishment of areas of protection.

Areas of protection are determined by official notice of the Water Law Authority or by ordinance of the head of the province; they can establish the prohibition or limitation of certain ways of management or utilisation of certain pieces of land or waters, as well as limitations on existing industries.

In such areas, limitations on land use for the purpose of water protection has to be compensated.

It has to be mentioned that in Austria ground water has the legal status of “private” water. So far the extraction of ground water has been free of charge, apart from compensations for land use limitations in the interest of ground water protection. A so-called “water penny” adopted in one province (a charge on the extraction of water) is very much discussed at present.

The determination of protection areas is possible for a concrete utilisation of water as well as for the protection of water resources for the future water supply. Whereas, in the above-mentioned cases, the waterworks pay compensations, it is difficult to find someone to cover the costs of the protection of resources. This is why this instrument has so far only been used in a few cases.

For the contents of the instructions concerning the areas of protection there are guiding principles which guarantee a uniform approach.

At present, in Austria there are 129 large protected areas besides a large number of smaller ones. This means that a total of about 6% of Austrian territory is subject to regular protection measures within the framework of legislation on water.

GROUND WATER UPGRADING

The Federal Minister for Agriculture and Forestry has to determine limit values by means of regulations laws on such substances which may endanger the utilisation of ground water. If these limit values are exceeded over a longer period and in a certain area, the head of government of a province must determine the area in question as ground water upgrading area by means of a further law.

In the ground water upgrading area intensified research has to be carried out in order to find out the causes of the exceeded values and, further, if there are no single polluters to be found, a general limitation of land use has to be imposed. This can be compensated by the federal government and the provinces together, however, with a retention of 20% for the person affected. Whereas for several regions planning is underway, so far only one upgrading area concerning nitrate has been established by law.

Besides these upgrading measures which are effective on a regional basis, the EU Nitrate Directive (Good agricultural practice and action programme) is being implemented for the whole of Austria.

CONTAMINATED SITES (DISUSED WASTE SITES, INDUSTRIAL PLANTS)

For the upgrading of contaminated sites which threaten the health of humans or endanger the environment, a financing instrument was introduced. Suspect areas, i.e. areas which can be a potential threat as a consequence of their previous use have to be evaluated. After an evaluation is carried out, the definition and the priority of the suspect area as a contaminated site is established. Suspect areas as well as contaminated sites are listed in central cadastral registers.

INSTRUMENTS OF INTEGRAL PLANNING

MAPPING OF THE NATURAL POTENTIAL OF A REGION

By natural potential one means the capacity of a region to meet the different needs of society with regard to land use, viewed from the standpoint of the maintenance of the balance of the whole ecosystem. The necessary elements are to be registered, documented, and evaluated.

WATER MANAGEMENT PLANNING

Water management planning is carried out by the federal government as well as by the provinces. The federal government, however, has more competence in issuing directives and in the co-ordination.

The heads of the provinces, fulfilling their duty of water management planning according to the Federal Act on Water, have the task of representing the interests of water management authorities towards other planning institutions, the task of elaborating the bases for areas of protection and upgrading areas, of controlling the development of water management and of their future direction. Moreover, other planning institutions are obliged to inform the organs which deal with water management planning. In practice, the task of this planning organ is carried out by an administrative unit of the provincial government, in some provinces also by a committee. This planning organ is involved in regional planning at provincial level and in local regional planning.

FRAMEWORK PLANS FOR WATER MANAGEMENT

The framework plans define the conditions which are to be aimed at for the development of the economical and living conditions of a certain area, whereby the various interests are to be harmonised as much as possible. They are implemented by the Minister of Agriculture and Forestry by official notice.

Similar plans can, for instance, deal with the designation of water resources for certain types of usage, limitations of the granting of rights of use of water or the recognition of the interests of certain persons affected by these limitations.

REGIONAL PLANNING LAWS AND PROGRAMMES RELATING TO REGIONAL PLANNING

Regional planning laws of the provinces determine the principles of planning; for instance, they ordain that areas with usable water or raw material resources are not to be submitted for land use in case it impairs these resources and possibly precludes their exploitation.

Programmes concerning regional planning make a zonation of the region in question with legal binding.

Amongst others, particularly zones apt for the exploitation of minerals and water protection zones, relevant ground water resources are harmonised with other aims of land use and presented in this way.

The determination of procedures for the establishment of regional planning programmes in which communities, representatives of citizens' interests take part, is essential.

Guidelines for subsidisation relevant to regional planning

The subsidisation of the water supply and sanitation granted by the federal government has an indirect influence on the structure plan of the communities and thus also on the development of settlements: the technical guidelines exclude the subsidisation of development costs for newly lotted building sites in determined settling areas.

In implementing the EU directive concerning the treatment of municipal waste water, sensitive areas are not determined, as the necessary measures have already been taken in the areas in question. Firstly, comprehensive measures relating to waste water were taken in catchment areas of lakes and then the same was done for rivers. Strict emission standards laid down by decrees form one part and a regulation on water quality standards which is being drawn up, the other part of the combined approach to water protection strategy.

Outlook

In principle, it has been shown that there are plenty of mainly legal instruments which serve the purposes of sustainable freshwater management and its implementation in regional planning.

Thus, future development cannot primarily aim at the development of further new instruments. Rather, it must comprise the implementation of the existing instruments, emphasising:

– improved harmonisation of planning institutions of the federal government and of the provinces and intensified application of instruments in integral planning;

– improvement of participation of the persons concerned and of the public in the planning process in order to improve the acceptance of the results of the planning process.

SITUATION IN DENMARK

DENMARK'S VISIONS FOR THE AQUATIC ENVIRONMENT

Denmark's overall vision is that development must be sustainable and must ensure well-functioning surroundings with high quality in nature and the environment to provide increased affluence and employment. Sustainable development must ensure the appropriate use of resources and a strong and balanced spatial structure in Europe.

The state of the aquatic environment is a decisive factor for the balance of nature and for the human drinking-water supply. Sustainable development in a comprehensive sense is therefore Denmark's vision for the aquatic environment in Europe.

Denmark gives the aquatic environment very high priority. The aquatic environment must be clean and well protected, and clean groundwater must continue to be able to be used as healthy drinking-water that is healthy both in the cities and towns and in the countryside.

MONITORING AND DEVELOPING KNOWLEDGE OF THE AQUATIC ENVIRONMENT

As follow-up to the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, the Government of Denmark has decided to develop strategic environmental planning and priority-setting based on continual monitoring and extrapolation of the state of the environment and nature.

Monitoring of the aquatic environment[13] demonstrates that wetlands such as bogs, marshes and moors as well as lakes and watercourses, which have been considerably reduced in size in the last century, are being exposed to extensive physical changes.

Many watercourses are also polluted; only about 40% of Denmark's watercourses could be considered pure or only slightly polluted in 1994. In the same year, the state of the environment was only satisfactory in 20% of thirty-seven lakes being monitored.

The monitoring also showed that there continue to be many cases of eutrophication in domestic waters, and nutrients, pesticides and heavy metals accumulate in the sediment.

The water supply both for towns and the countryside is obtained from pumped groundwater. Denmark's drinking-water is still clean and healthy. But the monitoring shows that there are increasing quantities of nitrates and pesticides in more and more drillings, which must therefore be closed and replaced.

13. Denmark's coast is about 7 000 km long. There is about 30 000 km of watercourses; more than 7 200 freshwater and saltwater lakes and ponds, of which most are lakes less that 2 ha, cover about 47 000 ha. About 150 000 ha consist of bogs, marshes, moors and the like. These freshwater wetlands and lakes cover about 6% of Denmark's land area.

The problem is especially severe in areas with intensive agriculture and on more porous soil types. On Sjælland there is a water shortage because of substantial water use, especially from Greater Copenhagen, combined with relatively little groundwater formation. In numerous areas near the coast and on several of the smaller islands, saltwater infiltrates the fresh groundwater resources because of excessive extraction.

The most important reasons for this situation in the aquatic environment are growing industrial activity, increasing intensive agriculture, the severe reduction of the amount of land covered with bogs, marshes, moors and other wetlands, the leaching of wastewater, especially from sprawling human settlements, drifting atmospheric pollution and percolation from contaminated sites and areas.

NATIONAL STRATEGIES

Denmark's efforts to improve the aquatic environment have been reinforced considerably since the 1980s.

One way this has been implemented is the substantial improvement of wastewater treatment through extensive construction of wastewater treatment plants. The storage capacity for liquid manure on individual farms has also been increased considerably. Marshes, bogs, moors and other wetlands have been protected, and nature restoration projects are being carried out.

The national strategies attempt to clean up the pollution of the past, to reduce current pollution and to create the conditions for a more natural aquatic environment and balanced use.

Heavily polluting industry is being located near the coast and in areas in which there is little risk for percolation.

Environmental impact assessment has been implemented through Denmark's planning system, so that spatial planning and the planning of projects that are likely to affect the environment significantly become part of an integrated decision-making process.

The strategy for groundwater and drinking-water includes designating areas of special interest for drinking-water protection. Designation of these areas is intended to ensure the supply of clean drinking-water in addition to the general protection of groundwater.

Thus, the use of pesticides and other environmentally harmful substances must be reduced, wastewater leaching must be stopped, the burden of excess nutrients must be reduced and old waste sites and other contaminated sites must be identified and cleaned up. The percentage of Denmark's area that is forested will be doubled over a long time period, and wetlands and other natural areas will be restored.[14]

The strategies are also being followed up, and the monitoring of the aquatic environment is being made more intensive and detailed.

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14. Denmark's land area is 43 000 km². The land is used for agriculture (67%), forests (12%), semi-natural areas (11%) and urban zones and transport installations (10%).

An example of a nature restoration project in western Jylland

In connection with the reclamation of land for agricultural cultivation, Skern River, which is Denmark's longest watercourse, was artificially straightened for large stretches from the hills of central Jylland to the mouth at Ringkobing Fjord.

Now Skern River is being restored to its original weaving course, and the land around the river will be allowed to re-emerge as humid permanent grasslands, marshes and bogs.

This is the largest nature restoration project in Northern Europe.

The objective is to solve problems with ochre and to reduce the large discharge of nutrients to Ringkobing Fjord, which is a protected area in accordance with the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (the Ramsar Convention) and the European Union directive on the conservation of wild birds.

So far more than DKK 50 million has been used on this project, mostly to purchase agricultural land.

PLANNING FOR THE AQUATIC ENVIRONMENT IN A COMPREHENSIVE AND DEMOCRATIC PROCESS

The responsibility for monitoring Denmark's aquatic environment and planning its use and protection is divided between the Minister for Environment and Energy and Denmark's fourteen popularly elected county councils and the Copenhagen and Frederiksberg City Councils. This is carried out as part of regional planning, which is a comprehensive spatial plan for a county and the basis for the county's administration in accordance with numerous acts, including the Planning Act, the Environmental Protection Act and the Protection of Nature Act.

Denmark's fourteen counties vary in size from 52 km² to 617 km² with the population varying between 45 000 and 624 000. The Cities of Copenhagen and Frederiksberg have a total land area of 10 km² with a total population of 562 000.

Thus the political planning for the aquatic environment is decentralised and based on an overall assessment of development in the county. Trends in a number of factors that are decisive for the aquatic environment, such as urban development, large technical installations, the extraction of raw materials, land use in the countryside and the protection of nature and environment in general are thereby coordinated with planning for the aquatic environment.[15]

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15. Based on an overall assessment of development in the county, the regional plan must include guidelines for:
. urban growth;
. large public enterprises that require special siting;
. major development projects;
. large shopping areas;
. especially valuable agricultural areas;
. afforestation areas;
. nature reserves with special qualities;
. recreational areas;

The objectives of national planning policies and strategies must be reflected in regional planning, and within this framework the counties' objectives for development are established. Planning for the aquatic environment is thus managed, based on the principle of framework control.

The regional plans are revised every four years, and the public is consulted in this process. The county council thus solicits ideas and proposals from individuals, businesses, nongovernmental organisations, public authorities and others and submits a proposal that is then subjected to public consultation. On this basis, the county council adopts the proposal with any changes that arise based on the nature of the public debate.

The Minister for Environment and Energy can, based on national interest, veto a proposed plan; it can then first be adopted in final form when agreement is reached between the Minister, who represents the state authorities involved, and the county council.

An example of the co-ordinating role of the regional plan

The island of Bornholm in the Baltic Sea is totally dependent on local groundwater resources for local drinking-water. Because of the geological situation on Bornholm, the resources are limited to relatively few areas, and most of the accessible groundwater resources are being used intensively today. If one or more sources should become unusable, it is unlikely that alternative drillings can be found to supply Bornholm with drinking-water from the island's own resources.

The regional plan for Bornholm County from 1993 therefore designated new afforestation areas on top of the areas where the groundwater is formed, similar to the regional plans in other counties.

One of the afforestation areas is located on the southern part of Bornholm. This area supplies about 15% of Bornholm's drinking-water.

As a result of the designation of the afforestation area, a large area was planted by 1995/1996. The use of chemical pesticides was stopped on both the new and existing forests in the area.

The new forests will provide considerably better protection of a large percentage of the island's meagre groundwater resources. In addition, they are arranged so that they promote open-air activities for the nearby urban communities.

. exploitation of stone, gravel and other natural resources;
. use and protection of water resources;
. the quality and use of watercourses, lakes and coastal waters;
. guidelines based on national planning.

THE PERSPECTIVE OF THE REGIONAL PLANS FOR THE NEXT TWELVE YEARS

Regional plans determine the development in each county for a twelve year period.[16] The next revision of the regional plans, which will take place in 1997/1998, emphasises the protection of the aquatic environment based on the national strategies. The recommendations of the Minister of Environment and Energy to the counties before the revision process starts describe the objectives of national planning policy and the frameworks for the various planning areas.

It is thus the counties that will designate the areas of special interest for drinking-water protection. This will be based on comprehensive analysis of the state of contamination and sources of pollution and surveys of the need for drinking-water in the various sections of the county.

The areas designated as being of special interest for drinking-water protection will form the basis for the follow-up of the national strategies for the protection of Denmark's drinking-water supply, including cleaning up the pollution from the past and future land use. The designated areas will thus especially protect the future drinking-water supply based on groundwater.

Another recommendation is that the targets for water quality in lakes, watercourses and coastal waters be assessed and, where they have not been fulfilled, the county council should establish guidelines for initiatives to be started to fulfil the targets.

Combined with Denmark's general protection of existing wetlands and other natural areas, it is intended that there will continue to be guidelines that ensure the potential for future nature restoration projects on reclaimed land such as previous marshes, bogs and moors, shallow lakes and branches of fjords.

PERSPECTIVES IN THE PLANNING EFFORTS

Sustainable development in the aquatic environment primarily requires changing the future land use for many areas.

Afforestation should probably be promoted considerably in many areas, and the land around water systems and in groundwater catchment areas must be removed from agricultural use or be converted to methods of cultivation that protect the aquatic environment better. This means not only visual but also structural and functional changes in the landscape.

The landscape is already subject to a number of general but often diverging and undesirable development trends. Some regions risk depopulation; others are threatened by intensive

16. A regional plan comprises a regional planning report and regional planning guidelines as well as map annexes. The plan reports on various regional planning themes, and the development for the next twelve years is assessed. The guidelines established on these premises comprise the basis for the administration by the counties in relation to the Planning Act and the additional sectoral legislation counties are responsible for administering. The map annexes to the regional plan shows the purposes for specific areas that are designated in accordance with the guidelines.

agriculture and forestry and still others are threatened by urban development and increasing pressure from tourism and open-air activity.

Some of these development trends can be promoted and others discouraged by the efforts to improve the aquatic environment.

Comprehensive landscape planning that integrates the objectives for the aquatic environment based on the overall perspective for each region and taking into consideration the landscape conditions and natural base instead of purely administrative borders will better be able to promote development that is ecologically sustainable, socially acceptable and economically appropriate.

An example of interregional co-operation across the border between Germany and Denmark

Based on the desire for a better basis for joint interregional environmental and nature projects across the border between Denmark and Germany, Sonderjylland County and the Ministry of Nature and Environment of Schleswig-Holstein have tried to create flexible models of co-operation for several years.

Numerous previous initiatives for interregional nature and environmental projects across the national border often failed because of the differing administrative structures in the two regions. This made it difficult to overview the distribution of tasks and responsibilities, and it was difficult to obtain support and financing at the same time.

The two regions therefore entered an agreement in 1996 on a structure with a joint comprehensive political forum that establishes the objectives and the framework for projects and a joint technical committee that presents proposals for the joint political decisions and co-ordinates the projects, the applications for financing and other tasks.

The transboundary projects in this co-operation include adapting drainage systems as a prerequisite for the stable development of the area near the North Sea, which is threatened by inland flooding. The development of common standards and objectives for watercourses and lakes and nature restoration are other potential projects in this co-operation.

The efforts of the regions to improve the aquatic environment are now based more on the prerequisites of the regions and the landscape rather than as previously on the administrative boundaries.

Sustainable development requires that society's overall consumption and the human impact on nature's cycles be limited to the environmental space. The environmental space comprises an objective for the optimal qualitative and quantitative use of resources.

The consideration of the environmental space in the aquatic environment, a perspective on what this means for environmental effects and resource consumption in each region and the results of the debate that can be initiated based on this will be an important contribution to comprehensive landscape planning that solves environmental problems without creating new ones.

Changes in land use in the countryside as the prerequisite for ecological sustainability in the

aquatic environment are closely related to the agricultural policies of the European Union. This connection has become even more pressing in recent years with increasing budgets in the European Union, new member states and the reform of the common agricultural policy in 1992, in which agricultural subsidy schemes have been changed from being based on products to being based on land area.

The overall objectives of the Union's common agricultural policy are to increase agricultural production, to ensure appropriate income for farmers and to ensure stable supplies of food at reasonable prices.

The further reform of the Union's agricultural policies requires integrated considerations of the aquatic environment with the purpose of developing sustainable agriculture in a broad sense. Based on the necessity of a more comprehensive perspective on each landscape, the future planning considerations for the landscape must increasingly be based on transboundary administration and the implementation of environmental standards as a condition for receiving subsidies based on land area.

The possibility should also be opened for suspending, with compensation, the use of a market regulation scheme for production in an especially sensitive agricultural area in which agriculture has considerable negative effects on the environment and nature, such as the aquatic environment.

European Union and national policies have designated land areas with several different purposes in protecting nature and the environment. The consideration of the aquatic environment in the broad sense plays a role in these plans with the objective of setting priorities and preventing inappropriate actions that can adversely affect the environment.

If the aquatic environment is to develop sustainably, the relationships between these land use designations and the Union's policies in relation to agricultural land use need to be investigated with the aim of obtaining synergy effects and preventing new problems from arising.

The active participation and enthusiasm of the public is decisive for achieving a comprehensive perspective on each landscape and thereby sustainable development for the aquatic environment. The motivation of farmers and foresters plays an increasing role in promoting changes in land use with the aim of improving the aquatic environment.

Nevertheless, this motivation is very limited. One reason is the difficulty in understanding the various plans and regulations. They are considered to be unclear and unco-ordinated in relation to other objectives, and they are not adapted to local conditions and potential. This has meant that the efforts have not had the intended effects or have been subjected to a much longer time perspective than was intended.

It is therefore necessary to investigate and remove the barriers between the objectives of the plans, the instruments to implement them and the decision-making basis of individuals. In this context, the promotion of local Agenda 21 activities is one way to improve the dialogue with the local public and thereby to initiate action that can be accepted based on local conditions and that has not been carried out with the previous methods of implementing plans and objectives.

A decisive factor is data on the public attitudes towards and understanding of the type of

environmental problems and their potential solutions, on how various population groups could potentially change their habits and lifestyles and on which instruments and incentives are most appropriate in various situations.

A more comprehensive perspective on each landscape in its natural context and boundaries, active public participation and sustainable development within the environmental space will be key features of Denmark's planning policies on the environment.

SITUATION IN SPAIN

INTRODUCTION

Spain's water problems began a long time ago. Since the first law on water was passed in 1879, numerous laws have been enacted at various levels throughout the twentieth century. However, it was only in the second half of the century that water quality became important; until then, it had been assumed that rivers were sufficiently able to purify themselves.

The balance was disturbed and water quality deteriorated as soon as the large urban centres emerged, and also as a result of economic development in the 1960s, migration, industrial expansion and the intensive use of fertilisers and plant protection products in agriculture.

The key year was 1985, when the current Water Act was approved and Spain joined the European Communities – which meant that the European water quality directives became a part of its domestic law.

Powers and responsibility for the protection of water quality were divided between the local, autonomous (regional) and central state authorities.

Local authorities are responsible for constructing and maintaining waste water collection and purifying plants, and operating them in conformity with the standards and objectives laid down for the discharge of waste water into these facilities. They are also responsible for framing local regulations on discharge into sewers and ensuring that they are respected.

The autonomous regional authorities are responsible for helping local authorities to implement purification schemes, and for drawing up and implementing master plans for treatment and purification. They legislate on certain aspects of water quality and fix charges for the setting-up and operation of plants.

The central state authorities control and monitor water quality, set quality objectives, authorise discharge into continental waters and fix the level of charges. They ensure that Community Directives are respected, co-ordinate operations and co-operate with the other authorities concerned.

Current situation

Agricultural irrigation accounts for 80% of total water consumption; water supply to urban centres and industry accounts for 14.5% and 6.5% respectively.

Urban consumption is 310 litres per inhabitant per year, which is modest compared with the figure for other European countries.

Water itself is very unevenly distributed. The southern and central Mediterranean basins, which account for 41% of the peninsula's area and 37% of its population, receive only 19% of the total water available on national territory. This low level of supply explains why water use rates top 60% in large parts of the country, entailing a serious risk of over-use of resources and posing a threat to water quality.

Water supply, treatment and purification are not always well managed. There are many different approaches: direct management, indirect management (joint companies, concessions, sub-contracting, interested management). Many plants are in poor condition.

Over 3 000 waste water purification plants are already in service, and more than 200 are under construction, covering approximately 60% of requirements.

The plants' treatment systems are frequently inadequate and too small.

In terms of equivalent population (including de facto population and pollution of industrial origin) the situation is less favourable, since only 40.75% of total waste water is treated (53.7%, if treatment plants under construction are taken into account).

There are major differences between different parts of the country.

Strategies implemented

QUALITY STRATEGIES

To protect public water resources and prevent deterioration, the Water Act sets out to:

– obtain and maintain a proper level of water quality;

– prevent toxic or dangerous matter, which might pollute groundwater, from accumulating in the subsoil;

– avoid any action which might cause water quality to deteriorate.

The Act stipulates that waste water discharge must be authorised. It sets quantitative and qualitative limits and fixes charges in accordance with the “polluter pays” principle. It also stipulates that the hydrological planning of basins must take water quality parameters into account and provide for treatment of discharged waste water.

The complexity of the corrective measures necessitated by the many different kinds of discharge has prevented a strategy geared to quality aims from working; a strategy of prevention and control has therefore had to be adopted instead.

This new approach is based on Directive 91/271/EEC concerning urban waste water treatment, which was incorporated into Spanish law by Legislative Decree 11/95 and the Regulation of 15 March 1996, laying down standards for urban waste water treatment.

The following strategies are currently used to achieve the general objective of protecting water quality:

– progressive reduction of the pollution load;
– monitoring of water quality;
– purification of waste water;
– treatment of sludge;
– planning of public water resources;
– protection of the environment and public water resources;
– more efficient use of water resources.

Progressive reduction of the pollution load

This can be achieved by reducing pollution at source and, in some cases, reducing water consumption.

Charges encourage users to save water, and also to take steps to treat it. Subsidies can be made available for changes in production methods which reduce pollution at source.

Emission standards and quality objectives are the last element in the pollution reduction strategy. The EU's emission standards (see Table 1 below) have been adopted for this purpose.

Table 1

Requirements for urban waste water discharged from purifying stations

PARAMETER	**CONCENTRATION**	**MINIMUM PERCENTAGE REDUCTION**	**REFERENCE MEASUREMENT METHOD**
Biochemical oxygen demand (BOD5)	25 mg/l 0_2	70-90	Determination of oxygen in solution before and after 5 days' incubation at 20^oC
Chemical oxygen demand (COD5)	125 mg/l 0_2	75	Using potassium dichromate
Total solids in suspension	35 mg/l*	90*	Filtration using 0.45 micron membrane. Drying at 105^0C

* Optional.

The above conditions are necessary to permit secondary treatment by biological sedimentation

or some other process, either to reduce concentration or to attain the percentages given in Table 1.

Urban centres must provide similar secondary treatment for waste water, in accordance with the following schedule:

– before 1 January 2001, centres with over 15 000 inhabitants (or equivalent population);

– before 1 January 2006, centres with 10 000-15 000 inhabitants (or equivalent population);

– before 1 January 2006, centres with 2 000-10 000 inhabitants which discharge waste water into continental water or estuaries.

However, centres with more than 10 000 inhabitants which discharge waste water into "sensitive areas" must have suitable plants by 1 January 1999 and subject this water to stricter treatment in accordance with Tables 1 and 2.

The following aquatic environments are considered sensitive:

– lakes, lagoons, reservoirs, estuaries and seawater areas which are already eutrophic or likely to become so in the near future if preventive action is not taken;

– continental surface water used to produce drinking water which is in danger of exceeding the current legal level for nitrate concentration;

– bodies of water which need secondary treatment to meet the quality standards laid down by current legislation on receiving waters.

There are very large sensitive areas in Spain, which has over 1 000 dams. It is estimated that 31% of dam water is eutrophic, i.e. contains a large quantity of algae and plant species, caused by the presence of nitrogen or phosphorus, which affects the biodiversity of organisms present in the water and the quality of the water itself.

Mention should also be made of conservation areas and areas of high ecological value, where water quality must be protected (e.g. Tablas de Daimiel, Parque Nacional de Doñana, Albufera de Valencia, etc.).

Table 2

Requirements for waste water discharged from purifying stations in sensitive areas

PARAMETER	CONCENTRATION	MINIMUM PERCENTAGE REDUCTION	REFERENCE METHOD
Total phosphorus	2 mg/l P (10 000-100 000 pE). 1 mg/l P (over 100 000 pE)	80	Molecular absorption spectrometry
Total nitrogen	15 mg/l N (10 000-100 000 pE). 10 mg/l N (over 100 000 pE)	70-80	Molecular absorption spectrometry

One or both parameters are applied, depending on the local situation. Concentration values or percentage reductions are applied.

In less sensitive areas, waste water may undergo treatment less rigorous than secondary treatment, if global studies show that discharge will not harm the environment and if the water undergoes primary treatment (BOD down at least 20% before discharge and solids in suspension 50%). This may apply in maritime areas, open bays, estuaries and seawater areas which have good water interchange and are not eutrophic or oxygen-starved as a result of urban waste water discharge. To preserve bathing water quality in coastal resorts, however, waste water sometimes has to be piped to the seabed.

In mountain areas above 1 500 metres, low temperatures may also make effective biological treatment difficult. Discharge is, however, permitted at limited concentrations determined by the equivalent population.

Water quality monitoring

Spain set up a water quality monitoring network (Red Coca) in 1962. It now has over 450 sampling points, and forty-four parameters classified in three groups are analysed regularly.

The network must make it possible to detect discharges and measure pollution load changes in any given section of a river. The Saica project was accordingly launched to:

– define a standard information system;
– define an integrated quality network (Red ICA) for each basin;
– obtain a systematic and specific water quality diagnosis for various uses and river sections;

– detect and instantly signal deviations from the surface water quality norms for automatic treatment plants;
– work out general criteria for the siting of automatic plants and quality parameter indicators;
– work out criteria for the siting of sampling stations.

The project comprises two phases:

1° Preliminary studies (1993-1994).
2° Setting-up of the network (1993-1997).

Supervision and evaluation of the results of urban waste water monitoring are governed by regulations which stipulate the minimum number of samples which must be taken, the maximum number of samples which may fall short of the norms in an annual series, and the maximum acceptable parameter discrepancies.

Purification of discharged waste water

The National Purification and Treatment Plan is the state instrument which is used to co-ordinate the work of the public authorities with responsibilities in this field and which makes it possible for Directive 91/271 to be implemented within the set time limits. Similarly, the Autonomous Communities have drawn up regional master plans for water purification. It is estimated that some 2 billion pesetas will be spent between 1995 and 2005.

Treatment of sludge

This principally concerns the re-use of sludge in agriculture. Some 45% of sludge is re-used in this way, while 30% has to be dumped, and 5% incinerated. Efforts are being made to increase the amount used in agriculture, but there are also plans to increase the amount incinerated, since only limited quantities can be dumped; moreover, to reduce damage to the environment, the discharge of sludge into the sea will be forbidden from 1999.

Planning of public water resources and protection of the environment

The first essential is to define public water resources clearly and regulate their use. The Linde and Pichra riverside and riverbank restoration programmes must be implemented for this purpose, and concessions for the use of public resources reviewed.

More efficient use of water resources

Incentives for the re-use of urban waste water encourage the finding of new solutions to water supply problems at local level, particularly in coastal areas where water storage and transport costs are very high.

Purified waste water is chiefly used for agricultural irrigation and the irrigation of parks and golf courses. It is used very little in industry at present, and in towns solely for street cleaning.

The areas which make the greatest use of purified water are the Balearic Islands, the Canaries, the Murcia region and some parts of eastern Spain.

STRATEGIES TO GUARANTEE SUSTAINABLE DRINKING WATER SUPPLIES

The main strategies used include:

– more water collection and storage facilities to guarantee supplies and overcome the problems caused by seasonal and annual rainfall variations and drought, which occurs regularly and can be more or less severe.

– basin management plans, covering present and future uses and requirements, with priority and compatibility criteria for the various uses. At times of drought, agricultural use is restricted in order to ensure adequate public supplies.

The Canary Islands rely very heavily on desalination plants for urban supply. This new system is also used or planned in a number of Mediterranean coastal towns, where prolonged drought can cause serious water supply problems.

Strategies needed for the future

Effective water quality conservation strategies are one aspect of sustainable water resource management. Co-ordinated management of supply and demand at sectoral and territorial level is another.

Supply should be managed with the help of a strategy which covers all stages (catchment, storage, distribution, treatment and purification), and efficiency and effectiveness criteria should be used to ensure that objectives concerning supply, as well as economic and social viability, are met.

The most important aim here is to make supplies surer by increasing available resources while limiting the impact on the environment.

Demand should be managed by applying a tariff strategy to all sectors of industry, since water resources are limited and can be increased only at considerable cost.

The right kind of tariff policy makes it possible to exclude certain users. Charges must cover long-term subsidiary costs and ensure the financial stability of suppliers. This will permit the effective use of water resources in both sectoral and regional terms, since a surplus in one area can be used to cover a shortfall in others.

4. European strategies of regional/spatial planning concerning sustainable protection of freshwater resources

4.1. Policies for the development and integrated management of large international water basins: the Danube basin

4.1.1. The Danube basin: description

The Danube river basin is the heartland of South Central and South Eastern Europe. The river flows for a distance of 2 857 km and drains an area of 817 000 km² including all of Hungary and Romania, most of Austria and Yugoslavia, nearly half of the Czech and Slovak Republics, a third of Bulgaria, significant areas of Germany, small areas of several former Soviet republics including Ukraine and Moldova. There are small areas of the catchment in Albania, Italy, Poland and Switzerland. The river receives twenty main tributaries. Down to the confluence with the Drava river the mean runoff rate is about 5 700 m^3/s.

The annual precipitation in the high alpine regions averages about 2 000 mm/y. In the plains of the lower Danube, precipitation is only 500-600 mm/y, falling to less than 400 mm/y in the Danube delta.

The diverse habitats of the wetlands along the river support a wide variety of species. The Danube delta in Romania and in Ukraine consists of rivers, lakes, reed swamps, meadows, sand dunes and forests. It is a rich economic resource of fish, timber and reed and is home to about 80 000 people, in an area of some 6 000 km². Up to seventy-five different species of fish can be found in the Delta and several globally threatened bird species.

Land use is highly diversified in the basin, including a wide range of agricultural practices, forestry, mining, natural areas, settlements and industries.

Ground waters are available practically in each of the Danubian countries. Shallow (phreatic) ground water, deep ground water in confined aquifers, karstic water in calciferous rocks and bank-filtered water in the alluvial terraces alongside the Danube and its tributaries all can be found in the Danube basin. Significance of ground water resources depends on the natural water household of the particular countries. For example in Bavaria, which covers the major part of the German Danube basin, ground water resources are as abundant as cca. the half of surface water resources, while in Hungary they are only cca. 5%. However ground water resources are exceptionally valuable component of freshwater resources, as in many cases they can be utilised without any significant treatment technology in drinking water supply and they are more protected against surface pollution sources.

4.1.2. Water uses

The basin supports the supply of drinking water, agriculture, industry, fishing, tourism and recreation, power generation, navigation and the disposal of waste waters.

There are some 500 major dams in the whole Danube basin; forty-six on the Danube river alone. As well as the major dams there are hundreds of locally significant small reservoirs used for drinking water supply, irrigation and industrial purposes.

Whilst the Danube flow is in general large enough to satisfy current needs, some tributaries, especially in the lower riparian states, experience seasonal water shortages. The situation contrasts with the countries more upstream, where water is relatively abundant year-round.
In all Slovakian sub-basins the main water user is industry (up to 71% of total surface water withdrawals). In the summer months especially this may damage the local water budget balance. A similar situation is reported from the Czech Republic, where industry, particularly power generation, is the biggest consumer of surface water and accounts for 47% of total consumption. In particular Bulgaria, Ukraine, Moldova and Romania extended irrigation systems were developed and up to 85% of the total water consumption was used for irrigation.

The dream of constructing a navigable waterway connecting the rivers Maine and the Danube, and thus the North Sea and the Black Sea dates back to ancient times. Navigation remained one of the most important form of the use of the River and its main tributaries in later times as well. The Danube-Rhine-Maine Canal was realised in 1992. With the purpose of navigation several hundreds of kms of the Danube and the tributaries has been regulated and/or dredged.

As to drinking water uses, e.g. in Austria ground water supplies 98% of all drinking water and about half of this comes from springs and karstic wells. In Slovenia 87% of drinking water is abstracted from ground waters. In Hungary most of drinking water (90%) comes from subsurface resources. In Slovakia, Croatia, Romania and Bulgaria a number of large towns and smaller municipalities are gaining their drinking water from the various types of ground water where hydrogeological conditions make it possible. Major cities (e.g. Linz, Bratislava, Zagreb, Craiova, Galati) and a number of smaller ones along the Danube and the tributaries use bank-filtered water. The Budapest region is Europe's largest bank-filtered water abstraction scheme with the capacity of more than 1 million m^3/day. The bank-filtered water resources only along the Hungarian Danube stretch are over 5.5 million m^3/day.

The special importance of ground water resources does not diminish the significance of drinking water supplies directly from the Danube and its tributaries or from storage reservoirs, being this kind of abstraction more exposed to sudden pollution events.

4.1.3. Human activities and impacts

The intensive agricultural, industrial and urban uses have created problems of water quality and quantity, and reduced biodiversity in the basin.

The most important problems (not in the order of importance) affecting the health of the Danube river ecosystems and the water users in the basin are the high nutrients loads (nitrogen and phosphorus), changes in river flow patterns and sediment transport regimes, contamination with hazardous substances including oils, competition for available water, microbiological contamination, and contamination with oxygen depleting substances.

The concentration of pollutants in the main stem of the Danube is in general similar to the improved levels currently found in the Rhine, principally because the flow of the Danube is about three times greater than that of the Rhine. There are important exceptions to this which include oil, the concentration of which is much higher in the Danube than in the Rhine, and some heavy metals which create significant public health and ecological concerns. The situation on tributaries is much more severe because in many cases the concentration of pollutants greatly exceeds acceptable standards. This reduces the availability of water and results in very high treatment costs of municipal and industrial water supplies, causes significant ecological damage and presents a risk for public health. Nevertheless the relatively low concentrations in the Danube river bed do not diminish the serious impacts on the Danube delta and on the Black Sea as the overall high amount of polluting substances are accumulated there despite the low relative concentrations.

In the last twenty years the total nitrogen and phosphorus loads from the Danube basin increased by 250% and 380% fold respectively. The agriculture sector contributes an average of 50% of the total load of nitrogen and phosphorus to the Danube. Over-application or improper application of fertilizers in the past has caused excess nitrogen and phosphorus to be transported into nearby waterways and ground water. Fertilizers are also often stored in bulk in the open, resulting in considerable loss. Municipal sewage, storm water run-off and seepage from unsewered areas are also major contributors. Industry, atmospheric deposition, etc. cause about 30-40% of the problem of nitrogen and phosphorus in the Danube.

The load of hydrocarbons is considered as moderate; the actual load of heavy metals and micro-pollutants such as pesticides are unknown. Hazardous substances of particular concern are pesticides, ammonia, other organic micropollutants. Figures of fecal coliform as measured by the International Danube Expedition in 1988 are showing values from zero (Vidin) to 300 (Visegrád); the most frequent values are about forty fecal coliform/ml.

Dams and reservoirs in the Danube and its tributaries are retaining the sediment, while river bank erosion is caused in the downstream stretches; a further impact is an essential change in the hydrological regime. The regular recurrence of inundation caused serious damage to the population in a considerable part of the Danube basin through several centuries. Flood levees were constructed at the length of several thousands of kms alongside the rivers. The earlier extended floodplains have been separated from the rivers by the flood levees and were brought under agricultural cultivation. For example in Hungary extended areas protected against inundation cover one third of the country's present territory.

In the Danube delta, biodiversity has been reduced and natural water and sediment transport system has been altered, diminishing the ability of the delta to retain nutrients.

Many of the ground water abstraction sites are in vulnerable hydrogeological situation (i.e. the aquifers tapped for utilisation are not covered with layers impermeable enough to isolate them from the surface pollution sources). They are seriously threatened since many point and non point contamination sources can be found in the abstraction areas; e.g. in Hungary cca. half of the present drinking water supply capacity is endangered by the most various pollution sources. Some indications of over-use of ground waters can be detected a.o. in Germany near large open-air lignite mines, in Hungary in the areas of coal and bauxite mining areas under karstic situations, and both in Hungary and in some other countries in the regions of high abstraction rates for drinking purposes.

4.1.4. Elements of integrated (and sustainable) water management

Water legislation is in continuous development in the Danubian countries taking up more and more elements of integrated water management and protection of waters. More or less updated water acts are in force in most of the Danubian countries which in certain cases together with the environmental acts are assuring the legal framework of an integrated water management. Licenses are required both for water abstractions and discharges. The majority of waters is public entity. Systems of abstraction/discharge fees and charges are applied expressing that finite public resources are being used, that the license entitles the user only to use the water under well defined conditions without giving the right to possess it, promotes the saving way of utilisation and more or less realises the “polluter pays” principle. Extended hydrological, hydrometeorological, hydrogeological and water quality monitoring systems are in operation in certain cases with long tradition and experience. Catchment management planning is in course in several countries. More or less advanced system of protection zones (wellhead protection areas) is applied in each of the interested countries aiming at the preservation of ground waters for the safe drinking water supply of the population, and in certain cases even the preservation of ground water resources for the future development of drinking water supply has been initiated.

Despite these elements, most of the Danubian countries are yet at a lack of a sound integrated and sustainable water management, in which:

- quantity and quality of surface and ground waters are dealt with in an integrated way;
- the preconditions are available to meet the demands of industry and agriculture, transport, power generation and recreation in sufficient quantity and quality giving priority to the safe drinking water supply of the population;
- additionally it is assured that water resources be sufficient to protect and sustain the good ecological state of the aquatic environment;
- the adverse impacts of floods and droughts can be minimised;
- all the actions and measures above are being taken in close interaction with regional planning; while

– the needs of the present generation are met without compromising the ability of future generations to meet their own needs.

Additionally, most of the Danubian countries are countries in transition having an unfavourable heritage of the past decades: deficiencies in the monitoring systems and in catchment management planning, lack of adequate waste water treatment plants and deficiencies in the level of the existing ones, abandoned waste dumps, overuse of nutrients, potential pollution sources around water abstraction sites, etc. Above all, lack of funds both for investments and operation is decisive and can not be overcome with raising loans (even soft loans) as most of the necessary investments are not bankable in their classic sense since both loans and concessions are leading to the rising of prices to levels unbearable by the population of these countries.

In Romania, two legislative initiatives have been taken to ensure a comprehensive framework of sustainable and integrated planning in hydrographic basins: the law on water (1996) and the draft law concerning the national plan on regional planning (Section II - Water) currently under discussion in parliament.

The basin-wide approach is extremely important in this region since the Danube basin is loaded with transboundary impacts because of the relatively small extension of the interested countries and high transport capacity of the watercourses. That is why it was an early recognition that the basin requires an integrated policy in water management as a whole.

4.1.5. Towards co-operation in the Danube basin

- Perhaps the first step was the Peace Treaty (Paris, 1856) closing the Krim War that established a "Standing Committee" (European Danube Commission) on the navigation of the Danube river. It existed by the year 1918 and was re-established by the Paris Peace Treaty in 1921. Then the Permanent Technical Commission on the Danube (CRED: Commission du Régime des Eaux du Danube) was established. It existed by September 1940.

- The present Danube Commission has been founded by the Convention Regarding the Regime of Navigation on the Danube (Belgrade, 1948). The activities of the Commission extend to all the questions and activities related to the free navigation in the Danube river.

- The Declaration on the Co-operation of the Danubian Countries on Problems of the Danubian Water Management, in Particular for the Protection of the Danube River Against Pollution was signed on 13 December 1965 (Bucharest Declaration).

- The idea of starting operational activities as part of technical assistance programmes for central and eastern Europe was endorsed by the Environment for Europe Conference, held in Czechoslovakia in 1991. The Danubian countries, international financing institutions, G-24 countries and non- governmental organisations decided to launch the Environmental Programme for the Danube River Basin (EPDRB), to create the Danube Task Force (TF) and its Programme Coordination Unit (PCU) and to

elaborate the Strategic Action Plan for the Danube River (SAP). The latter was endorsed by the Conference of the Ministers for Environment in 1994, in Bucharest.

- Also in 1991 the Danubian countries decided to prepare the Convention on Co-operation for the Protection and Sustainable Use of the Danube River and the Ecological Convention for the Danube basin. The Danube River Protection Convention (DRPC) was signed in Sofia on 29 June 1994. It is emphasising the urgent need for starting water management cooperation for the protection of the Danube river in a measure-oriented way to prevent, control and step by step reduce significant adverse transboundary impacts on the aquatic ecosystem within the Danube river basin with due attention also given to the protection of the Black Sea against pollution. It provides also for close cooperation with the EPDRB in the water sector.

- The Ecological Convention for the Danube basin is still in the process of negotiation.

- Out of the above multilateral processes and instruments at least twenty-five bilateral agreements are in force in the Danube basin covering issues of bilateral co-operation on transboundary waters from traditional engineering activities up to quality protection. Each of the agreements have their respective story and they are more or less different as to their orientations and contents as well, originating from the most various dates.

4.1.6. The European context

- The Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki Convention) was signed in Helsinki on 17 March 1992 and it has entered into force on 6 October 1996, constituting an all-European framework to the bi- and multilateral agreements on transboundary waters in the region.

- The Parliamentary Assembly of the Council of Europe decided to draw up a European Danube basin charter which would lay down principles for permanent Danubian co-operation at intergovernmental level and to set up an international council of the Danube which would be chiefly responsible for the co-ordination of existing activities.

4.1.7. Progress and results

- The Bucharest Declaration established a Danube river network of eleven water quality stations on the Danube. The programme has appointed competent national agencies to carry out the water quantity and quality monitoring and, at least every two years the agencies compare the results.

- Under the EPDRB diagnostic missions were carried out in seventeen tributary catchments of the Danube basin followed by pre-investment studies. The Danube Accident and Emergency Warning System (DAEWS) is under development. The National Principal International Alert Centres (PIACs) were established in each participating country and a first version of the Danube basin alarm model has been developed capable of predicting the arrival time and concentration of any accidental

pollution entering the river Danube or its tributaries, helping PIAC staff to decide when action should take place. The development of the Trans National Monitoring Network (TNMN) of fifty-five representative sites is under way together with strengthening the network of National Reference Laboratories and Information Centres. Significant equipment procurement are in progress together with training programmes. The Applied Research Programme comprising thirteen projects is running.

- Under the DRPC the transfer of particular expert groups from the EPDRB to the DRPC is in progress. As a new body, an emission expert group has been established with the purpose of assessment of point sources.

- Under the Helsinki convention the institutional structure is being prepared while from among the expert bodies the Task Force on Monitoring and Assessment produced considerable results in the preparation of Guidelines first on quality monitoring of surface waters, later on ground waters and making the preparations for that of quantity aspects.

- Bilateral agreements on transboundary waters has been signed according to the Helsinki Convention and the DRPC when new states are interested as a result of the recent political changes in the region.

4.1.8. Future prospects and needs

- The entry into force of the DRPC and the first Conference of the Parties are expected in 1997. Under the DRPC the institutional framework is being prepared together with the transfer of responsibilities and activities from the EPDRB. The latter is in the focus of discussions. The Convention, based on the precautionary principle, the polluter-pays principle, emphasising the necessity of equitability and that of sustainability seems to be the most efficient multilateral instrument to a basin-wide co-operation and to a coherent system of bilateral agreements on transboundary waters, aiming at the development of an integrated management of the Danube basin together with the necessary preconditions: uniform assessment, criteria, objectives, priorities set in a basin-wide transboundary context and with joint action programmes. However, it is questionable, how the donors and IFIs now funding the projects in the EPDRB can be involved in a new situation. The implementation of the DRPC requires a strong political will of the Contracting Parties political contribution from the EU and financial contribution of the present (and other potential) donors of the EPDRB. Here reference should also be made to the envisaged Danube recovery program and the Trust Fund as important elements to the implementation of the DRPC.

- As a parallel development, the Strategic Action Plan Implementation Programme (SIP) has been elaborated in the co-ordination of the PCU under the EPDRB presenting to Phare/Tacis and UNDP proposals for 1996-99 on a phased expansion of sewerage and municipal waste water treatment capacity, a reduction of emissions from agriculture, and conservation, restoration and management of wetland and floodplain areas in the Danube basin. Investment projects will require capital financing from banks and other sources. The proposals – forty-eight demonstration projects – focus on

eight of the main Danube tributaries. The total (or alternative) cost of projects in the SIP is estimated at US$ 89 million. The nine eligible governments would have a baseline contribution of US$ 53.3 million to the SIP, partly from national resources and partly from investment loans or other donor contribution. Incremental costs eligible for GEF financing amount to an estimated US$ 12.1 million, and costs eligible for Phare/Tacis funding is estimated to US$ 23.6 million. The SIP, just like the SAP is not derived from the DRPC but is considered as tools for its implementation. It is up to the IC of the DRPC to clarify the willingness of the donors which may require political will and the necessary arrangements in the structure of the DRPC.

- Developments under the Helsinki Convention will be decisive and applicable in the Danube basin. Clear connections should be developed between the institutions of the Convention and the DRPC. The envisaged European Danube basin charter and the proposed council will be further factors in this context and they may be of highly promotional nature if finding the means and ways of developing coherence with the other tools and processes.

- An outstanding instrument is the recent communication from the Commission of the European Communities to the Council and the European Parliament on a new European Community water policy aiming at integrated and sustainable water management in Europe. Such a policy if adopted may have a decisive influence on the introduction of policies of the same character in the Danubian countries and in the Danube basin as a whole.

The conclusion may be drawn that integrated management of the Danube basin aiming at the lasting protection of freshwater resources can be developed only upon the strong political will of the Danubian countries in a cooperative way, with outside assistance, some elements and the tools of which are already available: mainly the DRPC, the results of EPDRB and the professional experience accumulated in these countries.

4.2. Transfrontier co-operation in the event of flooding of rivers or critical water levels which cross several states

4.2.1. Introduction

In 1993 and 1995, flooding occurred along the Rhine and the Meuse in Belgium, Germany, France, Luxembourg and the Netherlands. Large tracts of land, including populated areas, were flooded. Many people were evacuated as a precautionary measure, especially in the Netherlands. The direct and indirect damage caused by the flooding was substantial. Floods are caused by natural factors and form part of the water cycle. They have always occurred and will continue to do so in future. The water levels in 1993 and 1995 were not exceptional. Flooding has been a normal, natural event in the past and will be so in the future. However, things have changed during the last seventy-five years. The effects of flooding are much more damaging and threatening than they have been. This is directly or indirectly caused by human activities, not only in the rivers themselves but also in the total catchment areas. The climate change of the last decades – directly man-made or not – promises more frequent and higher critical water levels in the years to come. This is not a problem of the Rhine and Meuse area alone. Many rivers systems in Europe have to cope with these problems – for instance in 1996 in Spain – most of them however in not as densely populated and economically vulnerable areas as the Rhine and Meuse areas. Neither is it a typical European problem. The dramatic flooding of the Missouri and Mississippi in 1993 and the recent flooding in California (1996) in the United States, have a similar background to the flooding of the European rivers.

NATURAL AND MANMADE CAUSES OF FLOODS

As stated above, flooding is a natural part of the water cycle. It occurs when large quantities of water rush into streams and rivers. A distinction needs to be made here between local floods, caused by torrential rainfall in small catchment basins, and floods covering whole regions, caused by major rivers. Floods in the latter category mainly occur in winter or spring following persistent, heavy precipitation, and the situation may also be exacerbated by melting snow or soil frozen so hard that water cannot seep away.

Flooding can also be influenced by human interference with vegetation, soil and watercourses. This applies to entire catchment basins, including tributaries and headstreams.

The main contributory factors here are reductions in the water-holding capacity of the catchment basins, the fast draining of rainwater through drainage networks and the reduced area of natural flood plains.

Land reclamation, the draining of wetlands for intensive farming purposes and the sealing of the ground surface by buildings and roads have significantly reduced natural water-holding capacity. The construction of embankments and advanced dykes has reduced the size of flood plains. The straightening of watercourses in order to improve navigability has also speeded up the flow of water.

At the same time, the risks of flooding have been heightened by the concentration of settlements and intensive farming or industrial use of land that originally formed flood plains.

The result is a significant risk of flood damage insofar as the dykes, weirs and other manmade structures offer only limited protection.

AN EXAMPLE: FLOODING IN THE MEUSE-RHINE REGION

In February 1995 the Ministers of the European Union member states responsible for the Rhine and Meuse agreed to develop a transnational action programme. In March 1995, the Ministers of Spatial Planning of the five European Union countries involved set up a working group to decide in what way spatial planning could contribute to the reduction of high water risks. These initiatives resulted in a strategy document for the Rhine and an interim report with planning principles and measures for both Rhine and Meuse.

The co-operation area of the above mentioned initiatives includes the river Meuse from its source to the North Sea and of the catchment area of the river Rhine from the Bodensee downstream to the North Sea. The Bodensee functions as a buffer and has a strong levelling function. For that reason the area upstream from the Bodensee has a separate high water management.

The Rhine and the Meuse are respectively 1 320 km and 925 km long and are fed by a catchment basin with a total area of 300 000 km^2 (48 000 km^2 for the Meuse and 252 000 km^2 for the Rhine). The Rhine and Meuse valleys have always been densely populated and seen much movement of goods and people. Over time, large conurbations and urban regions have grown up to form a concentration of settlements on a European scale (the largest being Basle, Strasbourg, the Rhine-Main and Rhine-Ruhr regions, Rotterdam and the Maastricht-Aachen-Heerlen-Liège region). The high population density and large transport volumes have intensified human intervention in the Rhine and Meuse river systems. There is no other region where the risks of flooding have been influenced to such an extent by measures to make more space available for human habitation in flood plains and to turn rivers into major waterways. In the process, however, preventive planning measures to reduce the risks of flooding tended to be forgotten, meaning that large and costly protective structures had to be built. Account also had to be taken of the particular topographical situation of the Netherlands, where long stretches of the two rivers in their lower reaches are above the level of the surrounding land. The floods in 1993 and 1995 showed very clearly that the measures taken offer quite limited protection only.

4.2.2. Flood prevention measures: objectives, principles and strategy

OBJECTIVES

The primary objective of all flood control measures is to protect people, animals and property against the danger of flooding. To this end, protective measures are usually taken in the regions liable to flooding. Although traditional flood control measures have improved significantly in technical terms, it is clear today that not all the possibilities for reducing the risks of flooding have yet been exhausted. New flood control schemes must therefore cover

much larger areas and have a lasting impact. They must go beyond the traditional protective measures and, instead of being confined to the areas most at risk, must include measures to reduce the risks of flooding in the medium and long term.

OBJECTIVES OF TRADITIONAL FLOOD CONTROL POLICIES

Traditional flood control schemes are aimed essentially at providing protection in flooded areas. They therefore involve primarily civil engineering, with protective structures being built on river banks, mostly in the vicinity of buildings at risk. Over time, as human beings have occupied river valleys and used them for farming and industrial purposes, they have also built dykes, weirs and other structures which now form the current system of protection against river flooding.

Retaining basins, which are mostly dammed in and located alongside rivers, also form part of this system. When they have proved inadequate to cope with floods, they have simply been made higher or stronger. In addition to structures of this kind, traditional flood control schemes include a series of precautionary measures designed to protect people and property in the regions at risk. These involve flood warning systems and on-call response units, the provision of transportable equipment (protective barriers, sandbags) and also pre-arranged evacuation plans.

The above are accompanied by precautions taken at the time of building in order to minimise the material damage floods can cause in and around buildings, the local population being encouraged to take the flood risk into account at the time of construction.

OBJECTIVES OF A NEW FLOOD CONTROL POLICY

Naturally, inhabited areas liable to flooding must also continue in future to be protected to the maximum extent possible by all the measures included in traditional flood control schemes.

Experience has, however, shown that the type of protection concerned is inadequate and will remain so, even when all the technical possibilities have been exhausted. In future, the construction of expensive structures such as weirs and dykes should logically be considered as a last resort only.

Accordingly, it is clear that flood control measures cannot be confined to the areas at risk, i.e. the end of the line. Attention will have to focus on all areas where humans influence – or could possibly influence – the factors that lead to flooding.

In this connection, consideration should be given not only to the situation in the riverside areas at risk (e.g. as regards urban development) but also to that of the watercourse in the catchment basin as a whole. The hydrology of the catchment basin is therefore just as important as the relevant land use patterns. Using this approach, account has to be taken of, for example, increases in the soil's water-holding and moisture-retention capacity, as well as measures taken to allow the discharge of larger and larger volumes of water during flood periods.

This new flood control policy also includes measures aimed at reducing the risks of flooding in the medium and long term. As it places greater emphasis on prevention, it broadens the objectives and the content of traditional flood control schemes, giving them a preventive dimension.

FLOOD PREVENTION, SUSTAINABLE AND ENVIRONMENT-FRIENDLY DEVELOPMENT

Under this approach, all tributaries within the catchment basin of a given watercourse are seen as potential sources of flooding and danger during periods of high water. The long-term goal of the preventive measures must therefore be to strike a balance between human activity and socio-economic development on the one hand and the sustainable and environment-friendly use of water as a natural resource on the other.

BASIC PRINCIPLES

A flood prevention policy must therefore be seen in the context of all the uses made of land throughout a given catchment basin. The following principles apply:

• Water is an integral component of land use

In the past, emphasis tended to be placed on draining land as quickly as possible so that it could be used or farmed intensively.

In future, it will be essential to allow rainwater to seep away or be held where it falls: it must flow through drains, ditches, channels and other watercourses more slowly and more naturally. Regional planning will have to take account of the land needed for the natural seepage, retention and flow of water, and development plans will have to set aside land for this purpose.

• Water must be held longer within catchment basins

If water is to be allowed to seep into the ground naturally and be held in the catchment basins of individual watercourses, limits must be placed on the sealing of the ground surface with buildings and roads. Forests, wetlands and other open spaces where moisture is retained easily must be preserved, and agriculture must take account of local needs and, if possible, avoid fast drainage for intensive farming purposes. In built-up areas, land use plans must leave enough open land for rainwater seepage and provide for publicly owned lakes and ponds to hold excess water.

• Water must have room to flow away slowly and without causing damage

Watercourses and their flood plains must be cleared of manmade structures so that water can flow away during periods of very high water without causing damage. Regional planning must take account of the risks of flooding. This applies both to major rivers and to all their tributaries, including the smallest of streams, and must also be remembered whenever the course of inland waterways is modified in any way. The building and extension of residential areas in alluvial and flood plains must cease. As the latter have been greatly reduced in area, attempts must be made to expand them again as far as possible so as to augment the water-

holding and carrying capacities of rivers, increase the areas of alluvial soil and recreate natural conditions. Weirs and retaining dams could be built in areas where there is no natural alluvial soil (mountainous regions) or where flood plains are unable to cope with floodwater.

• The risk of flooding must not be forgotten

In areas which are at (very high) risk or are protected solely by manmade structures, the population must be made aware of the risks of flooding, and reminded of them at regular intervals. Regions liable to flooding must be officially listed and the public made aware of them and advised about ways of avoiding the potential danger.

STRATEGIES TO BE IMPLEMENTED

The strategy to be pursued in order to prevent flooding is determined by the principles described above.

Given its objective, the strategy is based on three concepts:

Preventive measures aimed at reducing the risk of flooding:

– preserving and boosting the natural water-holding capacity of the entire catchment basin;
– preserving, recovering or recreating alluvial and flood plains;
– reducing flow rates;
– extending areas liable to flooding where residential building and farming are banned.

Improved flood protection for inhabited areas:

– incorporating protective measures in building techniques;
– setting up or improving warning systems, drawing up evacuation plans, carrying out other protective measures of an administrative nature;
– individual precautions;
– promoting solidarity throughout the catchment basin and publicising the dangers of flooding.

The implementation of the strategy demands an integrated and transnational approach for the entire region concerned. Given the implications of flood prevention policy, it is clear that the strategy must be accepted and adhered to by those in charge of all areas of activity which may influence land use throughout the relevant catchment basin. This applies in particular to the "preventive measures aimed at reducing the risk of flooding".

The strategy therefore concerns the national, regional and local authorities responsible for:

– regional planning;
– agriculture;
– town planning;
– water management;
– environmental protection;

– the economy;
– transport.

In the Meuse-Rhine region, flood prevention is acquiring a European dimension.

Following the 1995 floods, the riparian states turned their attention to ways of improving protection against flooding. They began by examining local measures aimed at reinforcing flood-control structures and increasing their height. However, it quickly became clear that measures to reduce the long term risks could not be confined solely to the regions at risk, i.e. the end of the line, but needed to cover the entire catchment basin of the two rivers.

For flood prevention purposes, the entire catchment basin is therefore regarded as a single entity where all measures liable to influence the hydrology must be examined from the angle of flood risk.

As the catchment basins of the Meuse and the Rhine impinge on the territory of six European states, transfrontier co-operation is necessary. The individual states must therefore show solidarity with their neighbours (this applies in particular to countries upstream in relation to those downstream) and must recognise that:

– uniform and co-ordinated strategies and measures are more effective;

– burdens ought to be shared out equally;

– each state's own experience and discoveries may help others.

4.2.3. The contribution of regional planning to flood prevention

The implementation of a flood prevention strategy demands an integrated approach encompassing several different policies.

Regional planning is thus one of the policies which can help put the flood prevention strategy into effect. Indeed, it has a particularly important role to play because of its multidisciplinary nature and its function in determining the various uses to be made of land.

Regional planning goes beyond the local context and co-ordinates and brings together the various sectoral planning activities which affect land use patterns. As such, it can have both a direct and an indirect impact on flood control.

a) Planning and flood control mechanisms

Regional planning can have a direct impact on flood control through planning and conservation mechanisms, as well as decisions on land use.

However, the regional planning systems applied in the catchment basin of the Rhine and the Meuse vary greatly from one state to the next. Differences exist in terms of their nature (centralised or decentralised), their legal force (regulations or orders) and the instruments available (laws, decisions, plans).

In all the states concerned, however, regional planning/development is used to promote integration and cohesion. As stated above, in addition to spatial planning, flood prevention essentially concerns areas such as town planning, the development of residential areas, the economy, transport, water management, environmental protection and agriculture. Any consistent flood prevention policy is bound to generate frequent conflicts of interest, which overall regional planning can help to resolve. For instance, the extension of human settlements along the Rhine will come up against the need to preserve (natural or manmade) flood plains.

Unlike sectoral policies, regional planning is not inherently dependent upon sectoral interests, but has to weigh up and reconcile different demands for land use. Its role is to assess and co-ordinate the various interests in order to find optimum solutions.

It is therefore an important instrument for reconciling divergent interests.

In all riparian states, regional planning will therefore play a key role in the preparation and implementation of a comprehensive strategy that incorporates all the relevant sectoral policies.

When co-ordinating and harmonising this comprehensive strategy, regional planners will have to ensure, as far as possible, that the flood prevention policy is also beneficial to other sectors ("win-win situation").

The protection and restoration of flood plains is, for instance, beneficial both as regards flood prevention and as regards environmental protection. However, there will not always only be winners. In the interest of flood prevention and in order to avoid repeating the mistakes of the past, it may be necessary to stand up to the opposing interests of town planning and agriculture and prevent remaining flood plains from being used as residential areas or farmland.

b) Regional planning measures

Regional planning can play a part in flood control insofar as it implements planning and protection measures, determines land-use patterns and helps to co-ordinate and reconcile different interests.

Most regional planning goes beyond the local context and covers several local authorities or municipalities. Under the proposed flood prevention strategy, regional planning can thus contribute to "improved flood protection for inhabited areas". However, the civil engineering work involved here has to be carried out solely at the local level. Systems for warning the population and other measures for protecting people and property against flooding do not come under regional planning either.

This is also true of the general measures (promoting solidarity throughout the catchment basin and publicising the dangers of flooding).

Regional planning does, however, have a major role to play in implementing the “preventive measures aimed at reducing the risk of flooding”. When land use within a catchment basin is being planned, it is important to take account of local needs in terms of flood prevention.

With regard to the “preventive measures aimed at reducing the risk of flooding”, regional planning must concentrate on the following:

– Definition of areas liable to flooding where residential building and farming are banned

Floods only cause damage when they affect areas used or occupied by human beings. The more intensively and inappropriately river valleys are used, the greater the potential and actual flood damage become.

If flood plain areas were specifically defined in regional development plans, this would prevent existing flood plains – especially those not covered in local development plans – from being used inappropriately for residential purposes or intensive farming (prohibition of developments likely to exacerbate the existing situation). In the event of conflicts of interest, priority must be given to flood control measures.

– Preserving or restoring flood plains

In order to meet the needs of flood prevention, the limits of alluvial and flood plains should be laid down in regional development plans and the areas concerned should be extended. As far as possible, the same criteria should be applied in this connection throughout the entire catchment basin.

As flood plains have steadily shrunk in area over the years, the areas subject to flooding as set out in regional development plans should incorporate the usable areas of the original alluvial and flood plains. This would create the conditions for recovering additional areas for draining and holding floodwater by moving dykes back or rebuilding hydraulic engineering structures (requirement to improve the existing situation). Depending on the technical resources available and the regional planning systems in individual states, these areas could be designated protected areas.

– Reducing flow rates

A further important step consists in slowing down the speed at which water flows, thus increasing the time it takes to dissipate.

This can limit or even prevent floodwater. The measures concerned must therefore cover the entire catchment basin. One possible method is recreating meanders in watercourses which have previously been straightened.

Depending on the geographical situation, consideration could also be given to building weirs and retaining dams or determining areas to be used for holding floodwater in the event of heavy rainfall. The areas concerned should be set out and protected in regional development plans. To prevent damage to nature or the landscape, the use of natural flood plains should be given priority over the construction of new weirs or retaining dams.

– Preserving and enhancing the natural water-holding capacity of the entire catchment basin

The natural water-holding capacity of catchment basins depends on the retention capacity of the soil and vegetation. In the context of its co-ordinating role, regional planning must therefore ensure that the use of land and forests takes account of local characteristics, while also limiting the sealing of the ground surface with buildings/roads and slowing down flow rates through improved rainwater retention and seepage.

At the same time, the preservation of forests and other areas of land with beneficial effects on hydrology must remain a constant concern of regional planning, as this can play a direct part in preventing flooding.

c) The need for transnational action

The proposed flood prevention strategy will bear fruit only if it covers the entire catchment basin of the Rhine and the Meuse. This requires an integrated approach involving the various relevant fields of policy in all the riparian states. The authorities responsible for regional planning must therefore co-operate closely in order to reconcile and co-ordinate their respective policies. This will be achieved through close transnational co-operation between the national authorities responsible for regional planning acting in conjunction with those responsible for water management.

The implementation of any strategy demands close co-operation with the national authorities responsible for regional planning. Given their role in ensuring integration and cohesion, only they are in a position to pursue in their respective states the integrated approach set out in the strategy.

They must give priority to establishing consistent regional development policies geared to flood prevention.

The purpose of the transnational approach is to implement co-ordinated measures in the riparian states. To this end, the states concerned must draw up a joint plan of action acceptable to them all. For the reasons given above, this task falls to the national authorities who, for their part, take account of the other areas of policy concerned.

The plan of action must set out criteria for determining areas liable to flooding or areas where regional planning measures need to be implemented as a matter of priority. It must lay down specific, practical measures, set priorities for their implementation and specify organisational arrangements and mechanisms for reconciling different interests. This presents a considerable challenge, as the size and transnational nature of the catchment basins mean that many differences have to be taken into consideration – in particular, differences between national systems of regional planning, as well as geographical and physical disparities.

The activities of international and supranational organisations have a direct and indirect impact on flood control. The main bodies concerned here are the European Union and the international river commissions. Regional planning authorities must also take account of this in their transnational co-operation and indeed take advantage of all the possibilities which these

organisations offer.

4.2.4. Conclusions and outlook

The complex problem of flooding is a challenge which must be taken up at European level, as only European co-operation can provide a solution.

The first step must be to draw up a regional/spatial development strategy that is coherent in the long term. Floods can be averted only if regional planning policy is geared to prevention. Where necessary, interlinking with other policies and measures aimed at improving co-operation should be examined closely. Regional planning must play a leading role, as it is in a position to identify areas where action will be most effective. Possible delays at national or international level must be avoided, this being an area where the transnational framework will provide added impetus. To achieve a better balance in the long term between land use and stream flow control, changes will have to be made to the various land use patterns and the way they are managed.

In addition, it will be necessary to identify and eliminate any causes for delays in the implementation of guidelines, regulations and laws, etc. Lastly, the pooling of information and knowledge between countries can also play an important role.

An effective international approach demands an appropriate political framework.

Lastly, attention must also be given to co-operation with all the national and international bodies which are trying to solve the problem of flooding or whose policies may have an impact in this area.

IV. RESOLUTION N° 2 ON STRATEGIES TO BE IMPLEMENTED WITHIN A COMPREHENSIVE REGIONAL/SPATIAL PLANNING FRAMEWORK FOR PROTECTING AND MANAGING FRESHWATER RESOURCES

The Ministers attending the 11th session of the European Conference of Ministers responsible for Regional Planning (CEMAT), held in Limassol on 16 and 17 October 1997;

having examined the report submitted by the Cypriot Minister and the background report prepared by the Committee of Senior Officials on sustainable regional/spatial planning in Europe and the protection of water resources;

aware that the problems concerning the protection of water resources have already been discussed in various international fora,

1. CONSIDER THAT:

. water is an extremely valuable resource which is essential to all forms of life; the stocks of freshwater are limited and unequally distributed and therefore it is imperative for the sustainable development of all European regions to preserve their integrity, to use them rationally and ensure their replenishment for future generations;

. securing of water is an integral part of the task of regional/spatial planning which aims to protect natural resources and create and maintain similar living conditions on the whole of the territory by means of a balanced and sustainable regional development;

. the quality of life of European citizens depends on the effectiveness of our efforts to protect and safeguard existing good quality water resources against pollution and on the implementation of measures which need to be taken in order to improve the quality of already polluted surface water or groundwater. Significant financial resources need to be invested in many European countries in the coming decade in order to meet the needs of social and economic development;

. water resources are exposed to increasing dangers not only in quantitative terms but also and especially in qualitative terms. The following factors contribute to this, their weighting varying from region to region: the input of harmful substances (from the air, from polluting materials, from excessive use of fertilisers and pesticides, from the discharge of inadequately treated effluent, from sewage sludge, rubbish dumps and existing waste deposits); the increase of built-up areas, including areas for traffic and transport purposes and in the water catchment following from the lowering of the water-table;

. it is necessary for all public planning authorities, enterprises and private households to attach greater importance to the protection of water. Regional planning, the water management authorities and specialists in other disciplines have the joint obligations to protect water quality and to secure water balance and water supply;

. all plans and measures should be based on the following general concepts of regional planning:

i. all water resources must be protected;

ii. the formation of new ground water must not be significantly restricted by the sealing of open space or other impairments to percolation. In addition to this it is important to avoid projects, measures and any influence (input of harmful substances) which can result in an impairment of the quality of the ground water;

iii. it is preferable to use water resources close to consumers than to open up new water resources in more distant regions. This means that each region should base its future development first and foremost on its own supply of water. The local security of water supply can be improved with the aid of integrated main systems;

iv. long-distance water supply can only be considered if there are no adequate water resources available locally or if water resources cannot be harnessed and the potential for water conservation has already been exhausted. Regions with a water surplus should hold these reserves available not only for their own use but also for those regions whose supply of water is inadequate to meet requirements;

. the general concept outlined above for a viable regional structure for using water resources is a sound basis for sustainable development in all European regions.

2. REAFFIRM THAT:

. the safeguarding of the quantity and quality of water is a top priority for Europe, as the availability of adequate quality is a key factor for regional development;

. striking the balance between the water use and the water ecosystem is fundamental for the development of Europe; having regard to the scarce quantity of water supply in some regions of Europe it is necessary to promote efficient water management policies in order to reduce the demand;

. it is essential for Europe to decide on a rational, comprehensive and long-term pan-European perspective for the efficient protection and management of water resources; such a perspective should take into account all types of water users and all water resources, and also take account of the principles of efficiency and sustainability and reflect the importance of water as a social and economic asset in meeting basic human needs, while encouraging awareness of the real societal costs of water usage;

. international, national and interdisciplinary co-operation is of crucial importance for protecting and efficiently managing existing water resources;

. the quality of major watercourses and major water reserves should be kept up to European standards, as non-respect of the norms leads, generally, to negative repercussions on the prospects for regional development and could have significant impacts on environmental conditions in other States;

. the restructuring of the economies and the social and administrative reform which are under way in many European states, which will affect developments in the industrial, agricultural and

the energy sectors should be closely co-ordinated with a European strategy for the rational and sustainable management of water resources;

. the European public must have easy access to information concerning the quality of water resources, the results from monitoring activities and the measures taken to safeguard water resources;

3. RECOMMEND THAT THE GOVERNMENTS OF THE MEMBER STATES IMPLEMENT THE FOLLOWING MEASURES:

i. at European level

. define on the broadest possible European scale the strategic objectives of a comprehensive water policy based on close co-operation between water management, regional planning and other disciplines;

. improve European regulations on the protection of water resources;

. promote regional and local responsibility for the effective protection and sparing use of water resources (helping people to help themselves);

. foster technical co-operation between states so that positive and innovative techniques for the development and the efficient use of water resources could be made generally available and be exploited quickly and cost-effectively;

. draw up integrated water management programmes consistent with an efficient strategy for entire water basins and eco-corridors along the river valleys, especially those which cross national boundaries, and decide which level (regional, national, international) is the most appropriate for the implementation of actions and projects;

. co-ordinate within the framework of international agreements the protection, efficient use and management of water from transfrontier watercourses, lakes and groundwater reserves; make full use in this respect of the ECE-Convention on the Protection and use of transboundary watercourses and international lakes;

. develop in the framework of the ESDP and of the guiding principles for sustainable and comprehensive development in Europe in the next century a coherent, long-term flood and drought prevention strategy that takes into account natural catchment basins.

ii. at national level

. approve co-ordinated national quality standards for the rational and sustainable use of surface waters and groundwater, as well as the protection of their biological diversity, define time limits for their implementation, establish reliable systems for monitoring and ensure that these standards will be taken into account in all regional/spatial, economic and social planning initiatives;

. draw up or update at regional level hydrological balances where this has not yet occurred.

These should show in particular potential risks to ground water, the degree of self-sufficiency and the need to take some actions in the event of any deterioration in water quality;

. draw up water management sector plans to improve the basis for the securing of areas for water supply and overall ecological balance on a long-term basis in regional plans;

. protect water resources in the interests of securing an adequate supply of quality water by means of appropriate legislative measures; similar measures should be envisaged to protect water resources needed in areas of activity where a high quality of water is necessary;

. give preference to the public supply of drinking water in the case of water resources used by industry and small businesses, even if drinking water quality is not required. In regions where groundwater abstractions give rise to over-exploitation, the supply of water to industry from groundwater should be gradually reduced in future as far as possible;

. reflect in national legislation the prevention of pollution at source and the "polluter pays" principle, the precautionary principle and appropriate penalties in order to discourage potential polluters of water reserves;

. promote all possible methods for recycling and re-using treated water;

. implement pricing policies that are geared towards cost recovery – including capital expenditure, operational costs – and an equitable and efficient allocation of water, including the promotion of water conservation and minimisation of wasteful consumption of water while ensuring that basic human needs are met;

. promote all possible measures for preventing the pollution of resources having in mind that prevention usually costs less than treating polluted water;

. encourage through a set of incentives and disincentives industries and agriculture, which are traditionally the larger users of water, to abide by codes of good practice and maximum efficiency for the use and management of water resources;

. encourage the participation and co-operation of the general public and local and regional authorities in an overall effort to protect the quality of water resources and promote public awareness on relevant issues.

4. REQUEST THE SECRETARIAT GENERAL OF THE COUNCIL OF EUROPE:

. to bring this resolution to the attention of all international Organisations and in particular the European Union, the Economic Commission for Europe (UN-ECE, Geneva), the VASAB 2010 Secretariat (Vision and Strategies around the Baltic Sea 2010) and the Organisation for Economic Co-operation and Development (OECD);

. to consider this resolution in the ongoing process of the preparation of the guiding principles for sustainable and comprehensive spatial development in Europe in the next century.