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**MEETING OF THE PARTIES TO THE CONVENTION
ON THE PROTECTION AND USE OF TRANSBOUNDARY
WATERCOURSES AND INTERNATIONAL LAKES**

Seminar on the role of ecosystems as water suppliers
Geneva, 13-14 December 2004

**WATER-RELATED ECOSYSTEMS: FEATURES, FUNCTIONS AND THE NEED
FOR A HOLISTIC APPROACH TO ECOSYSTEM PROTECTION AND
RESTORATION ***

Prepared by the secretariat
in consultation with the Swiss Agency for the Environment, Forests and Landscape,
the secretariat of the 1971 Ramsar Convention on Wetlands
and the UNECE secretariat of the Timber Committee

Introduction

1. During the past decade, the ecosystem approach has been increasingly applied in water management, encompassing inland water resources and riparian vegetation, wetlands, riverine floodplains and associated wildlife, habitats and human beings. In the UNECE region, the Guidelines on the Ecosystem Approach in Water Management (UNECE, 1993) promoted the idea that water resources should not be managed in isolation from other ecosystem components, such as land, air, living resources and humans present in the watershed. The watershed is thus considered as an entire ecosystem. The protection, sustainable use and restoration of its components are essential for the sustainability of water resources management. The annex contains a brief historic review on the recognition of the ecosystem approach in international forums.

* Late submission for consultations among the different partners involved in the seminar preparation.

2. The 1992 UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UNECE Water Convention) firmly embeds the ecosystem approach. Work in this area had been developed even before the Convention was adopted and, at their latest meeting, the Parties decided to include in their 2004-2006 work plan two seminars on this topic: the first on the role of ecosystems as water suppliers and the second on environmental services and financing for the protection and sustainable use of ecosystems.

3. The present document is intended to facilitate the discussion at the Seminar on the role of ecosystems as water suppliers. It focuses on the role of forests and wetlands in the water cycle and the advantages related to their protection, sustainable use and restoration in order to ensure sustainable water management and the supply of good quality water. It presents an overview of experience and best practices available in the UNECE region. The Seminar is expected to complete the information of this background paper and provide more details on current practice, take stock of the available experience and provide guidance on future policy development and implementation.

I. SPECIFIC FEATURES AND FUNCTIONS OF WETLANDS AND FORESTS

4. Water-related ecosystems, such as forests, meadows and wetlands,¹ form the landscape matrix. They support inland waters and their basins, which may stretch from mountainous areas to the sea. These ecosystems provide many economic, social and environmental functions and have considerable value. In particular, they play a great role in water resources management and drinking-water supply.

A. Flood control and local water storage in areas of flood formation

5. Floods, with severe economic and social impact, threaten many UNECE countries and have become the most common and costly “water-quantity problem” in the Mediterranean region as well as in parts of Western and Central Europe and North America. Forests and wetlands are an efficient means to mitigate flood effects and protect from and prevent disasters.

6. Forests can store water and delay its flow towards the lowlands and to the sea. Forest soils act as a reservoir as they usually have a higher water storage capacity than non-forest soils. Moreover, forest vegetation keeps water back and delays soil saturation. Evapotranspiration from forests of a certain age can remove a considerable proportion of storm rainfall. Surface run-off can therefore be prevented or slowed down, even in high precipitation events. The effect of flood reduction is particularly relevant at the local scale for small watersheds and small meteorological events.

7. Wetlands also have the capacity to store and slowly release surface water (formed from rainwater and snowmelt, including floods) and slowly release water from shallow groundwater aquifers, thus mitigating possible negative downstream effects.

¹ In this document water-related ecosystems encompass forests and wetlands such as marshes, fens and bogs; they do **not** include rivers, lakes and groundwater bodies.

8. By controlling rainwater, reducing erosion and preventing or mitigating local flash flooding downstream, wetlands and forests can replace expensive engineering structures for flood control.

B. Groundwater recharge

9. Forests and wetlands may change rainfall and run-off patterns, evapotranspiration as well as soil-water movement, thus influencing the way groundwater is formed from precipitation. The excess water that is not used by the vegetation or held in the topsoil is slowly transferred to shallow groundwater aquifers, which in turn steadily release water even after periods of drought and thus provide a reliable source of water, essential for humans and the maintenance of ecosystem functions.

10. This role of forests and wetlands is particularly important as many UNECE countries depend on groundwater as their main source of drinking water. This has led to an overuse of shallow groundwater resources and water abstraction from deep aquifers around cities. About 60% of the European cities with more than 100,000 inhabitants (or a total of 140 million people) are now supplied with water from overexploited groundwater sources.

C. Water purification

11. In general, forests soils, with a high humus content, rich in soil organisms, and a highly developed root system can purify rainwater by adsorption of contaminants during its passage through the different levels of the soil. The quality of the filtered water strongly depends on the composition, constitution and depth of the soil as well as the top vegetation layers. Thus the presence of a developed soil plays an essential role in maintaining the filter function and producing groundwater of high quality, with minimal nitrate and chloride contents, virtually no pesticides, few colloidal particles and virtually no undesired bacteria. In general close to nature forests are best suited for water purification.

12. Wetlands are also able to retain pollutants and excess nutrients. For example, high levels of nutrients commonly associated with agricultural run-off can be effectively removed by wetlands, preventing eutrophication in downstream water bodies; and in some cases toxic substances (pesticides, pollutants in industrial discharges as well as from mining and quarrying) can be taken up by vegetation.

D. Sediment retention and erosion reduction

13. Forests and wetlands tend to slow down the passage of water and encourage the deposition of sediments, thus reducing sediment transport, sedimentation of waterways and water pollution. In forests, high infiltration rates, interception of rain by forest canopies, the developed root systems and coverage of soils by forest vegetation and leaf litter counteract soil erosion and reduces the risk of landslides. Sediment retention and erosion reduction also have positive effects on infrastructure, such as decreasing deposition of suspended soil particles in water treatment installations, storage structures, pumping equipment and turbines, which in turn increases their operating lives and reduces their operation and maintenance costs.

E. Residual water flows

14. At present 31% of the European population lives in countries suffering from high water stress and demand for clean water is expected to increase throughout Europe in the future. This problem becomes even more acute during droughts and periods of low river flow. Forests and wetlands help to establish flow conditions that ensure life in aquatic and water-related ecosystems.

F. Reservoirs of biodiversity

15. Forests and wetlands provide habitats for a diverse range of species and are, as ecosystems in their own right, part of the world's biological diversity. Forests sustain aquatic productivity by shading waterways and moderating water temperatures. Forests also provide aquatic organisms with their habitat by supplying fish with wood debris and providing nutrients from leaves and decaying wood. Plants and fishing industries depend on species that need wetlands for their survival.

II. PROTECTION AND RESTORATION OF WATER-RELATED ECOSYSTEMS

16. Although the protection and restoration of water-related ecosystems have the above-described advantages, there are still many examples of unsustainable management of wetlands and forests that provoked negative effects on water, people, flora and fauna, and consequently on society. The protection of forests and wetlands and their sustainable use were not always a priority of State budget allocations. Lack of awareness, political, economic and technical choices of development, which did not take a long-term perspective, have often caused destruction of these ecosystems with negative consequences for the water resources.

17. Overexploitation, population increase, illegal logging, fire and development of transport infrastructure have affected forests to the extent that, between 1700 and 1980, the world's forest cover decreased by 19%. Mountain forests disappeared at the fastest rate (FAO, 2003). Within the UNECE region, while in Europe and North America forests areas are increasing, trends in Eastern Europe, the Caucasus and Central Asia cause concerns and data are not available. Worldwide, a third of the watersheds of rivers and lakes have lost 75% of their primary forest cover. The 9 million hectares of forests that are disappearing in the world every year have disastrous consequences such as floods, landslides, soil erosion, desertification and loss of biodiversity.² Large-scale clearing causes pollution of groundwater due to leaching of nitrate from polluted forest soils. It also decreases infiltration rates, thereby reducing groundwater recharge and increasing surface run-off and the risk of flooding. Deforestation due to large-scale clearing can lead to desertification and consequent overexploitation of groundwater resources.

18. Half of the world's wetlands have been destroyed in the past 100 years (Barbier, 1993). In Armenia alone, for the period 1930-1960, wetland loss was estimated at 60% (Jenderedjian, 2004). Human activities, such as unsustainable agriculture practices (logging, increased nutrients levels, pesticides), industrial activities (e.g. mining) and the resulting

² Biwako Declaration for Actions on Water and Forests, 2003, Roundtable on Water and Forests, Otsu, Shiga, Japan.

water pollution, engineering works (construction of dams, roads) and increased urbanization have altered wetlands. Wetlands have also been regarded as sources of disease and were thus eliminated (EPA). This negative image of wetlands is a great obstacle to reversing trends and implementing a more sustainable management.

19. The draining and decrease of wetlands can have disastrous consequences. The bottomland hardwood-riparian wetlands along the Mississippi river, for example, used to store at least 60 days of floodwater. The filling or draining of most of them has reduced their storage capacity to 12 days, thus increasing the risk of flooding (EPA). In recent decades, the draining of wetlands and the “hard engineering approach”, which includes the installation of powerful pumps, the straightening of river courses and embankment constructions, have also led to the overexploitation of groundwater resources and serious flooding (SAEFL et al, 2002).

20. At the same time, there are many examples of good practices of integration of forests and wetlands in water management, recognizing that protection, sustainable use and restoration of upstream forests and wetlands positively affect the quantity and quality of water downstream.

21. In the Morava-Dyje wetland, shared among Austria, the Czech Republic and Slovakia, the maintenance of traditional land use supports flood control. In the river Cassarate (Ticino canton of Switzerland), many years of reforestation and extensive agriculture have increased the surface of the stabilized forest thus reducing the risks of flooding, mudflows and rockfalls which endanger the villages in the valley and the city of Lugano; in the Grisons canton, in the 1900s, the River Moesa and its alluvial zone were heavily impacted, the riverbed eroded and the groundwater level lowered. Between 1998 and 2000 a project by national, cantonal and local authorities, the Swiss National Fund for Landscape and the NGO Pro Natura succeeded in creating new floodplains by removing the artificial structures and lowering the rivers banks.

22. In order to protect soil and its properties, water and ecosystem functions, and infrastructure, and protect managed natural resources against natural hazards, more than 124 million hectares or 11.5% of forest and other woodland have been designated as official “protective forest areas” in Europe (MCPFE, 2003). Also on 81% of these areas, in particular in Ukraine, Georgia, Cyprus and Poland, the main forests management goals are the protection of soil, water and the forest’s other ecosystem functions. In Bulgaria, natural and restored wetlands have the status of protected areas in order to remove pollutants from the Danube river system.

23. One of the most important functions of forests and wetlands is the supply of drinking waters. Of the world’s 105 largest cities, 33 rely on drinking water from protected areas (Dudley and Stolton, 2003). In some cases, the protective functions of forests have been specifically recognized, leading to the protection and conservation of forested areas for drinking water supply of large cities. Examples in the UNECE region include:

- **New York** (United States of America): the Catskill/Delaware and the Croton or East of Hudson watersheds are the two systems that satisfy New York’s drinking water needs; 75% of these watersheds are covered with forest. The Catskill Forest Reserve,

a part of the city's environmental protection plan, has many mountain peaks, most of them protected, and reservoirs that supply New York. For New York City, it is calculated that, by opting for the land and forest resource protection strategy, the city is going to make important savings: the costs of this approach is estimated at around US\$ 1 to US\$ 1.5 billion over ten years, while the alternative corresponding to the establishment of a treatment plant would cost US\$ 6-8 billion plus the annual operating costs;

- **Istanbul** (Turkey) lies on two peninsulas and the water reservoirs and natural springs that have been providing water to the city since the fifteenth century are located in forests on both peninsulas. The Belgrad forest has several water reservoirs and at one time all the drinking water for the city came from this forest. The functions of the forest include providing water and preserving the soil. Today's increased demand in water supply is being met by using another forest, the Istranca forest, which is a conservation site near the Bulgarian border. Despite the site is situated far from the city, its choice indicates the importance that the Turkish authorities attach to the role of forests and the necessity to protect them in order to guarantee a regular water supply of good quality;
- **Stockholm**: 40% of the watershed of Lake Bornsjön, the main source of the city's water supply, is covered with forests. Management of this area focuses on protecting water quality by leaving areas for conservation and restoration;
- **Basel** (Switzerland): the city meets its needs in water by treating water from the Rhine. Water is allowed to run into small channels through a forest where it is infiltrated into the subsoil and thus purified. In the whole of Switzerland 38% of water supplied is untreated. Knowing that treatment costs can average around Sw F 0.20 per m³, the use of this water from underground sources and mostly from forested watersheds, which needs no treatment, saves the Swiss State Sw F 80 million (i.e. US\$ 64 million) annually;
- In **Germany** and especially in Lower Saxony, watersheds are now being converted from predominantly coniferous ones to mixed stands close to nature forests with a high proportion of deciduous trees because it has been proved that lower levels of nitrates are leached into the soil. This conversion is part of forest regeneration measures taken by the Government to promote "drinking-water forests";
- Forests on the riverbanks, around lakes and reservoirs that provide **Moscow** with drinking water also help to ensure high water quality;
- **Minsk** is surrounded by a green belt and a protective zone surrounds the city's reservoir in order to ensure water quality.

24. Contaminated water is responsible for 7% of all deaths and diseases in the world (World Bank, 2003). In the UNECE region, an estimated 120 million people do not have access to safe drinking water and adequate sanitation, making them more vulnerable to water-related diseases. Cleaner water and better sanitation could prevent over 30 million cases of water-related diseases each year in the region. Ecosystem protection can contribute to securing safe drinking water. Furthermore, in many cases, preferring ecosystem protection

to building a water filtration plant lowers health risks due to the malfunction of sewage and water filtration plant and can also prevent threats to public health caused by disinfectant-resistant pathogens.

25. Crucial aspects are the monitoring and assessment of the efficiency of protection and restoration measures with regard to water management and the definition of future measures needed to meet the set performance objectives. These are very complicated tasks depending on the nature of the ecosystem and the complex interaction of its characteristics (e.g. geomorphologic, physical, chemical and biological features). Further research is needed to better understand of these interactions and define appropriate policies.

III. THE INTEGRATED APPROACH AS A DEVELOPMENT OPPORTUNITY

26. Water resources and water quality are both important elements of development processes, but they tend to be dealt with in a sectorial way and by different institutions and forums without the needed collaboration. The integrated water resources management plans, which are to be prepared worldwide in accordance with the Plan of Implementation of the World Summit on Sustainable Development (paragraph 26)³, will require a multidisciplinary approach, combining land and water management. The recognition of the vital role played by ecosystems, their protection and sustainable use will also be an essential aspect of these plans.

27. Economic and legal tools alone cannot sufficiently protect existing water-related ecosystems. Information sharing and dissemination of good practices at local, national and international levels among relevant authorities and institutions are essential to: enable better cooperation and integration of policies; facilitate regional and international initiatives; disseminate technical knowledge and experience; and strengthen political support.

28. In particular the management of transboundary water resources and water-related ecosystems requires such an exchange, which not only benefits the knowledge base but also the transboundary cooperation in general. The establishment of the transboundary Romania-Ukraine Danube Delta Biosphere Reserve has allowed the exchange of expertise on the management of wetlands between these two countries. Also the joint Armenian-Georgian project establishing a transboundary biosphere reserve in the Javakheti Plateau aimed at protecting wetlands in the Kura-Araks has positive effects on the water quality in the river basin and promotes political stability in the region (Jenderedjian, 2004).

29. The current attention given to freshwater issues does not put enough emphasis on the role of water-related ecosystems in providing solutions, possibly due to a lack of awareness. Promoting awareness, for instance through information campaigns and other specific activities, about the role of wetlands and forests as water suppliers among the different stakeholders in the whole watershed (national authorities, the public and the private sector) is essential. The benefit to upstream and downstream populations should be publicized.

30. All stakeholders, including the public, should be involved in the planning and implementation of basin-wide water-related projects to guarantee integration of forests,

³ See <http://www.johannesburgsummit.org/>.

wetlands and water management policies, their efficiency and sustainability and related long-lasting compliance. There are several successful examples in the UNECE region and many NGOs advocate such an integrated approach and promote protection and restoration of water-related ecosystems. For example, “Forest Trends” (<http://www.forest-trends.org/>), an American NGO for the protection and restoration of forest ecosystems, promotes incentives that diversify trade related to forest activities. Preserving forest ecosystems and promoting their sustainable use help to attain more sustainable water resources management. (Perrot-Maître et al, 2001).

31. To convert the principles of the ecosystem approach into action, there is a need for capacity-building in many areas such as stakeholder participation, improved governance, innovative financing and establishing necessary policies.
32. Further research is also needed to investigate the competing processes involved; assess the environmental impact; understand the site effects and the other still unclear aspects (e.g. micro-pollutants).
33. Governments have invested large amounts of money in water-related infrastructure. The value of necessary infrastructure needs is estimated at US\$ 80 billion, and will increase to 180 billion per year in the next 25 years (World Bank, 2003). Considering the economic advantages water-related ecosystems can provide, their protection, sustainable use and restoration can prove to be a cost-effective alternative to infrastructure development. It has been calculated that the costs of replacing basic forest services (production of pure water, flood control and recreation) would be billions per year, in the case of a forested watershed with a city of 50,000 people (Ecoforestry, 1998). The value of water storage function of China’s forests, for example, has been estimated at 7.5 trillion yuan, which is three times the value of the wood in these forests (Dudley and Stolton, 2003).
The economic values of the world’s wetlands is estimated at up to US\$ 70 billion per year just considering that one hectare of tidal wetland saves US\$ 123,000 (Lum et al., 1998; Schuyt and Brander, 2004). The Congaree Bottomland Hardwood swamp in South Carolina (United States) saves US\$ 5 million, according to 1990 estimates. This is the cost of a more technical alternative to wetlands’ natural capacities: building a waste-water treatment plant (EPA).
34. Public payment schemes are the most common mechanism for financing ecosystems protection and restoration. Economic incentives and disincentives for protecting ecosystems, such as tax deductions or subsidies, are also frequent.
35. Other alternative payment schemes are also applied. Successful examples include compensating upstream forest owners for the protection of hydrological services or payments by hydroelectric plants, drinking-water consumers and users of irrigation systems: in some cities in Japan and South America, water bills include a tax for the afforestation of the watershed which provides the water. Tax benefits to forest-rich municipalities and compensation to farmers for restoring sufficient areas of forest, floodplain and wetland on the basis of reduced losses from future flooding are other important opportunities. Alternative payment scheme types can promote the notion “nature for water” and the implementation of the ecosystem approach in water management. The seminar on environmental services and financing for the protection and sustainable use of ecosystems to be organized in 2005 will

explore the financing alternatives and disseminate experience of solidarity between upstream and downstream communities by means of innovative economic tools.

36. Since it heavily depends on regular provision of water, the private sector can be involved in the protection of water-related ecosystems and in the payment for their services through innovative partnerships with governments or voluntary agreements. For example, the French bottler of natural mineral water, Perrier-Vittel, considers that reforestation sensitive infiltration zones is cheaper than building filtration plants. It pays upstream landowners so that they use best management practices on their land (Dudley and Stolton, 2003).

IV. LEGAL AND ADMINISTRATIVE DIMENSION

37. Integration of forests, wetlands and water management is an interdisciplinary pursuit that calls for interaction between different disciplines, departments of government and sections of society. Law, as a vehicle for orderly change, and the related supporting institutional arrangements play a vital role in the implementation of integrated practices at the local, national, transboundary, regional and international levels.

38. At the local and national levels, in the UNECE region, countries have created different types of legal and institutional frameworks for the protection and restoration of water-related ecosystems and their integration with water management:

- The Belgrad forest, which supplies drinking water to Istanbul, has the status of "Preservation Forest" by law;
- In British Columbia (Canada), forests and woodland along stream and riverbanks are protected by the Forest Practices Code to maintain water quality;
- Certain states of the United States have created laws to regulate activities in wetlands and their development. In some cases, local wetlands protection ordinances have been adopted. The United States Environmental Protection Agency is charged with protecting wetlands using a regulatory tool like section 404 of the Clean Water Act. Acquisition is another strategy used for the protection of wetlands, by establishing national wildlife refuges.

39. On the transboundary level, the Water Convention with its obligation to promote sustainable water resources management, including the application of the ecosystem approach (art. 3), provides the framework for the ecosystem approach in water management, in the UNECE region.

40. Its Protocol on Water and Health, aiming at preventing, controlling and reducing water-related diseases, includes specific provisions on the protection of water resources and their related ecosystems. The Protocol introduces a social component into cooperation on water management: water resources management should link social and economic development to the protection of natural ecosystems.

41. At the global level the 1971 Ramsar Convention on Wetlands is one of the most important environmental agreements dealing with water, especially with the integrated management of important water-related ecosystems and water allocation. It formally recognizes the important hydrological functions of wetlands in the water cycle and catchment basins, including their role in groundwater recharge, water quality improvement and flood alleviation.

42. In the UNECE region, there are also examples of subregional cooperation for environmental protection and sustainable development that include measures for integrated management of forests, wetlands and water resources:

- The Convention on the Protection of the Alps (Alpine Convention), done at Salzburg, Austria, in 1991, provides a comprehensive framework for the preservation and protection of the Alps, including measures for nature conservation, forest preservation and restoration, and water management;
- The Framework Convention on the Protection and Sustainable Development of the Carpathians, adopted in Kiev in 2003, acknowledges the importance of subregional cooperation for the protection and sustainable development of the Carpathians. The Convention promotes the ecosystem approaches and contains provisions for integrated approach to land and water resources management, and spatial planning. Its article 6 requires Parties to reduce water habitats fragmentation and pursue policies that aim at preserving and protecting wetlands and wetland ecosystems. Its article 7 urges the Parties to promote practice of environmentally sound agricultural and forestry measures assuring appropriate retention of precipitation in the mountains with a view to better preventing flooding.

43. Several transboundary projects have been developed leading to the establishment of agreements, joint institutional arrangements, etc.:

- The Environment Ministers of Austria, the Czech Republic and Slovakia have signed a memorandum of understanding to implement the Ramsar Convention in the wetlands of the Morava-Dyje transboundary region in order to promote the wetlands' coordinated sustainable management;
- In the border region between Switzerland, Austria and Liechtenstein, crossed by the river Alpenrhein, flood protection used to be the only preoccupation in water management policies, but the impacts on other sectors and risk analyses led to the authorities reconsidering this approach. As a result a basin-wide transboundary development plan is being established to integrate flood protection, groundwater management, hydropower generation and ecological goals;
- The Prespa Park was established in 2000 in the border region between Albania, Greece and the former Yugoslav Republic of Macedonia. It is the first transboundary protected area in the Balkans. Joint activities in the Park include the establishment of a coordination committee with representation from the three countries (with government, local society and environmental NGO participation); the completion of a strategic action plan for the sustainable development of the Prespa Park that lays down common strategic policy and management directions, and assesses the priorities

for specific projects and activities in the region; and the development of a multi-year joint programme for the integrated ecosystem and resource management in the Prespa Park funded by the Global Environment Facility (GEF) and other major donors. This joint initiative makes it possible to integrate national efforts towards the sustainable development of natural resources that were used to be taken separately by each country.

44. The European Community with its sixth Environment Action Programme (2002-2012) follows a multi-track approach to environmental protection and water resources management that builds on existing policies and instruments, among others:

- The Community legislation protecting water quality and water resources, reducing air pollution, acidification and eutrophication, and mandating environmental assessments of projects and (in future) land-use plans and programmes;
- The establishment of the Natura 2000, network which involves the identification of the most representative natural areas and ecosystems that need to be protected and managed;
- The contribution of the LIFE programme's nature projects to the implementation of the Community's nature policy.

45. In particular, the EU Water Framework Directive provides a comprehensive, integrated legislative framework for the management of water that establishes strong links between water protection legislation and nature protection.

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Annex

BRIEF OVERVIEW OF THE RECOGNITION OF THE ECOSYSTEM APPROACH BY THE INTERNATIONAL COMMUNITY

The United Nations Economic Commission for Europe with the Seminar on ecosystem approach to water management (Oslo, May 1991) and the 1993 Guidelines on the ecosystem approach in water management as well as the UNECE Water Convention with its obligation to promote sustainable water-resources management, including the application of the ecosystem approach (art. 3) were among the driving forces of the ecosystem approach in water management. Although the focus was on aquatic ecosystems, other ecosystems, most importantly water-related ecosystems, such as forests and wetlands, have also been taken into account in promoting the ecosystem approach in the region.

This is also supported by chapter 18 of Agenda 21, which requires Governments to “make certain that adequate supplies of water of good quality are maintained...while preserving the hydrological, biological and chemical functions of ecosystems”. The need for an integrated approach to water resources management is stressed as this will help to avoid “*costly measures to rehabilitate, treat and develop new water supplies*”.

The sequence of events below shows that, after the United Nations Conference on Environment and Development (Rio de Janeiro, Brazil, 1992), the need to protect and restore aquatic and water-related ecosystems, which have a decisive function for sustainable water management, was also recognized worldwide, and was often embedded in decisions and ministerial declarations.

1996: 6th Conference of the Contracting Parties to the Ramsar Convention on Wetlands

The need to integrate wetlands into river basin management was spelled out in resolution VI.23, which recognized: “the important hydrological functions of wetlands, including groundwater recharge, water quality improvement and flood alleviation, and the inextricable link between water resources and wetlands.” It also acknowledged “the need for planning at the river basin scale which involves integration of water resource management and wetland conservation.”

Further resolutions strengthened these principles: 1999 resolution VII.13, providing guidelines for identifying and designating karst and other subterranean hydrological systems as wetlands of international importance; 1999 resolution VII.18, providing guidelines for integrating wetland conservation and wise use into river basin management; 2002 resolution VIII.1, providing guidelines for the allocation and management of water for maintaining the ecological functions of wetlands; 2002 resolution VIII.12 on enhancing the wise use and conservation of mountain wetlands; 2002 resolution VIII.34 on agriculture, wetlands and water resource management; 2002 resolution VIII.40, providing guidelines for rendering the use of groundwater compatible with the conservation of wetlands.

Furthermore, guidelines on the Ramsar Convention's "wise use" concept and the ecosystem approach are being prepared for possible adoption at the ninth Conference of the Parties in 2005, based on the recent findings of the Millennium Ecosystem Assessment.

1998: International Conference on Water and Sustainable Development (Paris)

The Paris Declaration on Water and Sustainable Development recognized the importance of ensuring the achievement of "sustainable development, management and protection, and equitable use of freshwater resources." The importance of "promoting local and national systems for managing the sustainable use of water resources, based on an integrated approach linking development with protection of the natural environment" was also noted. The Declaration also emphasizes the preservation of ecosystems and protecting ecosystems to maintain and rehabilitate the natural hydrological cycles.

2000: Conference of the Parties to the Convention on Biological Diversity (5th meeting)

The ecosystem approach became an essential part of action plans. Decision V/6 describes this approach as "a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way."

2003: 3rd World Water Forum (Kyoto, Japan)

Paragraph 24 of the Ministerial Declaration states that "to ensure a sustainable water supply of good quality, we [the Ministers and Heads of Delegation] should protect and use in a sustainable manner the ecosystems that naturally capture, filter, store, and release water, such as rivers, wetlands, forests, and soils."

2003: G8 Action Plan on Water

The G8 Action Plan on Water¹ aims to reverse the current negative trends of environmental degradation. The Action Plan underlines the importance of reinforcing efforts in order to "provide assistance for the development of integrated water resources management and water efficiency plans" and to "support better management and development of shared river basins." Another important element of the Action Plan is to "develop an institutional framework that is stable, transparent and based on the rule of law, respecting fundamental human needs and ecosystems conservation, and promoting local empowerment and appropriate cost recovery approaches."

2003: International Freshwater Forum (Dushanbe)

With their Dushanbe Water Appeal, the participants called upon all stakeholders to commit themselves to achieving the Millennium Development Goals (MDGs) and the targets and actions agreed under the Johannesburg Plan of Implementation, inter alia, by "implementing integrated water resources management, based on an ecosystem approach, considering the interests of all sectors benefiting from water resources (energy, agriculture, industry,

¹ See <http://www.g8.fr>

environment, water supply and sanitation, etc.)” and by “promoting the sustainable use and restoration of water related ecosystems such as forests, wetlands and coastal ecosystems as a contribution to achieving the WSSD biological diversity goal of a significant reduction to its current rate of loss by 2010.”²

2004: Conference of the Parties to the Convention on Biological Diversity (7th meeting)

Decision VII/11 (para. 8) on the ecosystem approach³ notes that in addition to sustainable forest management, some existing approaches, which are also relevant to other environmental conventions, including ecosystem based management, integrated river-basin management, integrated marine and coastal area management, and responsible fisheries approaches, may be consistent with the application of the Convention's ecosystem approach, and support its implementation in various sectors or biomes. Implementation of the ecosystem approach in various sectors can be promoted by building upon the approaches and tools developed specifically for such sectors.

2004: Eight special session of the United Nations Environment Programme's Governing Council/Global Ministerial Environment Forum (Jeju, Republic of Korea)

Ministers emphasized that integrated water resources management should incorporate an ecosystem approach as the basis for achieving the MDGs and the targets of the World Summit on Sustainable Development. This requires : involvement of regional and local authorities, the private sector, civil society and local communities, especially women; active support by the international community for capacity-building, technology transfer and international financing; and cooperation with all relevant partners.⁴

2004: United Nations Commission on Sustainable Development (12th session)

The Chairman's summary on the 12th session of the Commission on Sustainable Development notes that “delegations generally reaffirmed their commitment to integrated water resources management as an appropriate holistic approach and guiding principle for implementing water sector reforms and balancing water use among competing uses, including ecosystem services” (para. 62). The Chairman's summary also states that “it was noted that healthy ecosystems are a prerequisite for clean water and that the value of ecosystems has to be appreciated in the planning process” (para. 67).

² See <http://www.freshwaterforum.org/index-eng.htm>.

³ See <http://www.biodiv.org>.

⁴ See <http://www.unep.org/GC/GCSS-VIII>.