LIFE III

focus




LIFE and Europe's rivers

Protecting and improving our water resources

nature

EUROPEAN COMMISSION

environment

European Commission
Environment Directorate-General

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Foreword

Peter Gammeltoft (left), and Michael Oliver (Desk Officer, LIFE Unit)

As sources of water and means of transportation, Europe's rivers have been crucial for many human settlements. Industries have developed by rivers for the easy shipping of manufactured products and the importing of goods and materials. Economic activities, however, have placed a heavy burden on many rivers, which have also been used as natural sewers.

But in the last twenty years, initiatives to clean up Europe's rivers and reduce the amount of industrial waste and sewage being discharged into rivers have had a marked impact. Today, rivers are not only sources of water, energy production, irrigation and transportation, they are once again becoming recreational sites, used for bathing, sailing and fishing.

As part of the EU's Water Framework Directive (WFD) which was adopted in December 2000, the European Commission has set an ambitious target of achieving good ecological status for all Europe's rivers by 2015. While significant progress towards this goal has already been made, much more work remains to be done. The impact of human activities continues to threaten the ecology of rivers in many areas of Europe.

The main tool to achieve WFD objectives will be the river basin management plans, the first of which should be published by December 2009. In case of river basins encompassing more than one country, the WFD requires Member States to coordinate their plans. For those river basins shared with third countries, Member States should encourage transboundary cooperation with non-EU countries.

The Commission's environment and nature project funding programme, LIFE, offers an excellent opportunity for drawing up and implementing such river basin management plans. The examples featured in this brochure form an overview of how LIFE co-funded projects have helped Member States meet the requirements of the WFD. Projects have helped to implement the directive by testing, validating and demonstrating procedures and approaches that aid the management and sharing of information and the development of guidance on technical issues.

As well as having a long-lasting local legacy, ensuring sustainable management practices, many of the LIFE projects have also advanced innovative tools and technologies that enable better river basin management. Other projects have demonstrated how river basin management plans that involve the local community can boost a sense of ownership and responsibility for river cleanliness among local residents.

LIFE-Environment and LIFE-Nature projects have also targeted other issues included in the WFD, such as flood protection and groundwater, or they have focused on issues detailed in other European Directives, such as nitrates, birds, habitats, urban wastewater treatment and drinking water. This brochure presents a selection of the more than 150 river projects have received LIFE co-funding.

Peter Gammeltoft
Head of Unit – Protection of Water and Marine Environment
European Commission, DG Environment

Contents

Environmental problems related to Europe's rivers

There have been some remarkable improvements in recent years in the ecological status or water quality of certain European rivers such as the Rhine and the Danube. However, rivers in many parts of the Community are at risk of not reaching good ecological status or potential by 2015 due to a range of human activities. Their traditional use as recipients of effluent has had obvious negative environmental impacts. But there are other negative impacts such as 'river regulation' (irrigation, drainage, the construction of navigation channels, reservoirs, dams, etc.); damage to habitats and over-exploitation or direct impacts on species.

Status of Europe's rivers/ human pressures

The three largest European Union river basins are the Danube (817,000 km^2), the Vistula (194,000 km^2) and the Rhine (185,000 km^2), which together drain approximately a quarter (27%) of the EU-27 territory. Europe's rivers today are used mainly for water supply, energy production, irrigation and transportation. But their use for recreational activities such as sailing, bathing and angling and other amenities is also increasingly important. The growing number of users and uses of rivers – perhaps especially around the many areas of Europe with high population densities and high industrial development – has increased the exploitive pressures on rivers, posing a risk to human health and adding to the pollution of Europe's coastal waters.

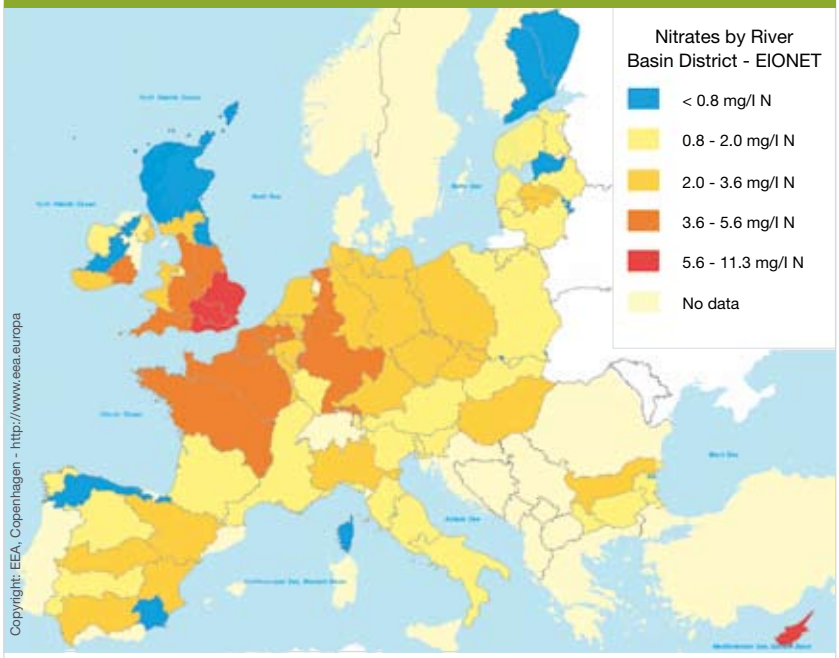
Over the past 20 years or so, according to the European Environment Agency (EEA)[1], there have been significant advances in the treatment of sewage and industrial wastes being pumped into Europe's river systems. This has led to lower levels of most pollutants and a measurable improvement in water quality. The agricultural sector, on the other hand, has not made such good progress, as it has been under pressure to intensify to remain profitable. Nitrate levels are still as high as they were at the beginning of the last decade. High nitrate levels can result from 'runoff'[2] carrying surplus fertiliser – which can cause eutrophication[3].

1 EEA - Indicators: http://themes.eea.europa.eu/Specific_media/water/indicators/WEU05,2003.1010

2 Water from precipitation or irrigation that flows over the ground and into bodies of water. It can contribute to soil erosion and carry harmful pollutants.

3 Eutrophication refers to the accumulation of nutrients (nitrates and phosphates) in a body of water. This process can occur naturally but recently has been accelerated by nutrient runoff from activities (farms and sewage) input. Algal blooms result and their decay removes dissolved oxygen, eliminating aerobic organisms such as fish.

Mean annual nitrate in rivers for 2005 by National River Basin District



The map shows the average mean annual concentrations of nitrate measured at EIONET-Water river monitoring stations located within National River Basin Districts (RBDs) during 2005. (EIONET validates monitoring data from national databases and adds information on the physical characteristics of the water bodies and on the pressures potentially affecting water quality)

Not only the quality of water but also the quantity available for human use is of importance, says the EEA, adding that more and more frequently there are problems with water scarcity around large cities and in southern Europe.

The main factors that increase the risk of not achieving good ecological status, or potential, in European rivers are:

- *Nutrient enrichment (eutrophication)* – one of the principal sources of organic pollution discharged

into Europe's watercourses is from organic waste around areas of Europe with high population density and high industrial development. High levels of organic pollution tend to reduce the concentration of oxygen in water and thus affect all riverine species and habitats. Rivers with low population densities normally have reduced levels of organic pollution – for instance in Nordic countries and other mountainous areas. The agricultural sector too, with its fertilisers and manure enrichment of soil increases the concentrations of nutrients (nitrates, ammonium and phosphorus) in water that is associated with the river flow alteration (dams, reservoirs, etc) boosting the propagation of algal booms and hence water turbidity. Nevertheless, over the past 15 years the levels of organic matter concentration and nutrients in the European rivers have been gradually decreasing (see box).

- *Physical interventions including river regulation* – that is the physical changes that man imposes on watercourses, such as the construction of reservoirs and energy production (hydro-electric dams), channelisation and navigation structures, land drainage and irrigation, maintenance work (removal of obstacles to water flow, sediment removal, etc.). Such measures may result in a disconnection of the rivers from floodplains with a negative impact on dependent habitats and species. They may also cause disruption of the river sediment system (erosion, transport and deposition), and/or disturb aquatic organisms, for example by hindering the up- and down-stream migration of migratory fish, or by changing water flows and temperatures.

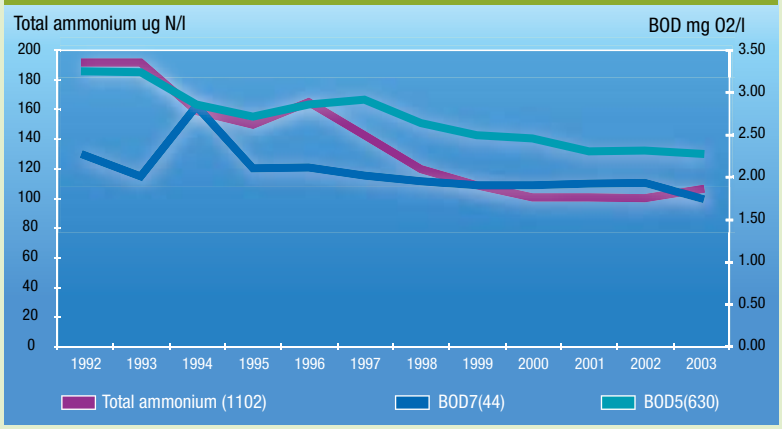
Other environmental problems affecting European rivers include:

- *Acidification* – decreasing of the pH levels caused by sulphur and nitrogen oxides deposition (as a result of the combustion of fossil fuels) into the rivers' catchments. This increased acidification can result in a toxic environment that has a significant negative impact on the ecosystems of rivers. Surface water acidification first became an issue of public concern in the 1970s when awareness was raised by incidences of major fish kills in the rivers and lakes in the southernmost part of Norway and along the west coast of Sweden.
- *Organic micro pollutants* – an increased use of pesticides and the production of other organic substances has led to pollution of watercourses. Pesticides entering the aquatic environment may have serious impacts on flora and fauna and limit the use of the water for drinking water abstraction. The source of these substances is linked to agriculture and industry. While the effects of some organic chemicals are well known [DDT, (Dichloro-Diphenyl-Trichloroethane), PCBs - Polychlorinated Biphenyls, etc] there are other substances where the real impact on the aquatic environment remains unclear. Minimum standards (i.e. the maximum permissible concentrations of pesticides) are regulated by Directive 97/57/EEC, in line with the revised Drinking Water Directive (98/83/EEC), at 0.1 µg/l.
- *Heavy metals* – the main sources in Europe's rivers are industrial and mining facilities. Concentrations of heavy metals are decreasing in European rivers and are regulated by the Water Framework Directive.
- *Radioactivity* – nuclear plants are normally located near water sources and thus increase the risk of contamination of the rivers by radionuclides. The heated water released by the nuclear plant cooling systems could also have localised impacts on the river ecosystems.

Concentrations of organic matter and ammonium

Concentrations of organic matter and ammonium generally fell by around 50% at [monitoring/research] stations on European rivers during the 1990s, reflecting improvements in wastewater treatment. Northern European rivers have the lowest concentrations of oxygen-consuming substances measured as biochemical oxygen demand (BOD) but concentrations are higher in rivers in some of the new EU Member States and candidate countries where wastewater treatment is not so advanced. Ammonium concentrations in many rivers in EU Member States and accession countries are still far above background levels.

Biochemical Oxygen Demand and total ammonium concentrations in rivers between 1992 and 2003



Source: EEA – environmental Indicators
http://themes.eea.europa.eu/Specific_media/water/indicators/WEU05, 2003.1010

Ecological importance of rivers

Although rivers only represent a tiny proportion of Europe's surface area, they make significant contributions to the welfare of Europeans.

SUPPLYING SERVICES

Products obtained from river ecosystems

- Food and raw materials: including a vast range of food products derived from plants, animals and other organisms, as well as materials such as wood.
- Fresh water: rivers are important for the supply and regulation of fresh water.
- Energy: wood and hydroelectric power.
- Genetic resources including the genes and genetic information used for animal and plant breeding and biotechnology.
- Transport: Essential role in transportation of goods and people – both business and leisure.

REGULATING SERVICES

Benefits obtained from regulation of ecosystem processes

- Climate regulation: river ecosystems can influence climate.
- Disease regulation: changes in the riverine ecosystems can directly influence the abundance of disease vectors, such as mosquitoes.
- Water regulation: flood control, alleviation of drought, etc.
- Erosion control: riverside and floodplain vegetation cover plays an important role in soil retention and the prevention of river erosion.
- Water purification: river ecosystems can help to filter out and decompose organic wastes

CULTURAL SERVICES

Non-material benefits obtained from river ecosystems

- Recreation & ecotourism
- Aesthetic
- Educational
- Sense of place
- Cultural heritage
- Spiritual & religious

SUPPORTING SERVICES

i.e., those necessary for the production of all other ecosystem services

- Soil formation
- Nutrient cycling
- Primary Production
- Biodiversity (habitats and species)

Photo: LIFE98 NAT/D/005372

Adapted from: "Ecosystems and their Services", Chapter 2 of Ecosystems and Human Well-being; A Report of the Conceptual Framework Working Group of the Millennium Ecosystem Assessment, Millennium Ecosystem Assessment Board, Washington, DC: Island Press, 2003, pages 56-60.

Biodiversity loss

All of the above factors threaten biodiversity loss. Around 250 species of macrophytes and 250 species of fish inhabit European inland surface waters, and a significant number of birds and mammals depend on freshwater wetlands for breeding or feeding. Physical changes and water pollution have had a detrimental affect on many European freshwater habitats and resulted in the loss of their natural vegetation and animal life [source: "European Rivers and Lakes – assessment of their environmental status", EEA (1994)].

Most environmental problems concerning Europe's rivers have evolved gradually because of development pressure or lack of knowledge on how best to protect water resources. However, certain catastrophic pollution incidents such as the Sandoz disaster on the upper Rhine in 1986, as well as the more recent spillages of toxic mining waste which affected the Doñana region of Spain and the Tisza river and its tributaries in Romania, Hungary and the former Federal Republic of Yugoslavia, as well as the catastrophic floods along the rivers Danube and Elbe in 2002, have triggered action to improve river basin management on a European scale.

Rivers need to achieve good ecological status

The EU Water Framework Directive (discussed in the following section) provides an opportunity for implementing better planned, long-term water management measures that should help to minimise the impact of, or at least provide the necessary tools for, a more rapid and effective response to environmental problems in the future.

European Union Water policy

The increasing demand by Europeans for cleaner rivers (as well as lakes, groundwater and coastal beaches) was highlighted by a recent Eurobarometer opinion poll. When asked to list the five main environmental issues that Europeans were worried about, on average almost half of the EU25 respondents said they were worried about "water pollution" (47%), with figures for individual countries going up as far as 71%. This demand by Europe's citizens for sufficient quantities of good quality water for all purposes is one of the main reasons why the European Commission has made water protection one of its main priorities. The Water Framework Directive (WFD) [2000/60/EC], with its overarching theme of integrated water management at the river basin level, is the operational tool for achieving the EU's goal of 'good status'[1] for all Community waters by 2015.

Water Framework Directive (WFD)

Adopted in June 2000, the framework directive is currently in the initial phase of implementation in Member States. Involving a phased process, with strict deadlines for achieving 'good status', it sets out how water should be managed in an integrated way throughout the EU territory within river basin districts. A key element is that it obliges neighbouring countries to work together to improve water quality in cross-border areas where they share the same river basins.

The main elements of the WFD schedule are set out below. But the most important upcoming deadline with regard to river basin planning is that by the end of 2009, Member States should have developed a management plan and a programme of measures for each river basin district, taking into account the results of studies (e.g. of the impact of human activity on the watercourses, economic analyses of water use etc.). 'Basic measures' (set out in Article 11 of the directive) are compulsory and represent the minimum steps required to achieve 'good water status'. They include the measures required by existing EU water-related Directives.

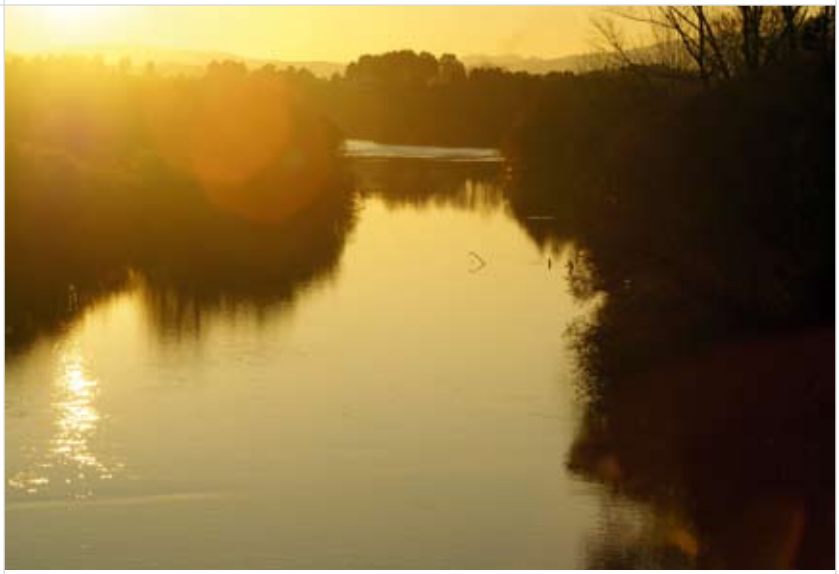


Photo: João Pedro Silva

In line with WFD requirements, rivers need to achieve 'good ecological status' by 2015

Deadlines for WFD implementation

Year	Action
End 2003	WFD transposed into national law/ River Basin Districts identified
End 2004	Analysis of pressures/impacts and economic use completed
End 2006	Establishment of monitoring network/ Start of public consultation
End 2008	Present draft River Basin Management Plans
End 2009	Publish River Basin Management Plans, including progamme of measures
End 2010	Introduction of pricing policies
End 2012	Programme of measures operational
End 2015	Environmental objectives achieved

Main elements of the WFD

- The directive establishes a clear environmental target of **'good status'** for all ground and surface waters in the EU and provides a framework for the coordinated implementation of all other water legislation. It maintains existing commitments of Member States under the Nitrates Directive (91/676/EEC) and Urban Waste Water Treatment Directive (91/271/EEC).
- **Integrated river basin management** is the framework within which

1 The different 'status' categories used in the directive (high, good, moderate etc) are measures of the degree of deviation of a given water body from its original, natural condition i.e. without human impacts.

Photo: LIFE98 NAT/A/5422

Flood damage of the Danube, Austria

measures for achieving 'good status' are to be implemented.

- **A River Basin Management Plan (RBMP)** must be developed with transboundary basins requiring joint management between two or more Member States (and possibly with countries outside the Community).
- The precise measures to be taken within a given river basin may vary widely according to what is most appropriate – but a 'programme of measures' must be fully operational by 2012, with a progress report submitted to the Commission.
- Control of all **pollutant emissions and discharges** into surface waters using a 'combined approach', based not only on the overall quantity of a given pollutant, but also on its concentration in the receiving aquatic environment.
- Specific controls for certain **higher risk pollutants** on a priority basis, with progressive reduction, phasing out, and/or cessation of emissions.
- **Water pricing** is to be introduced by 2010 – acting as an incentive for the sustainable use of water resources and helping to reduce unnecessary consumption.
- **Public participation** is a fundamental component of the directive. Article 14 obliges Member States to ensure that draft river basin management plans are published for public consultation and comment one year before the start of the period to which the plan refers.

Examples of international cooperation in River Basin Management Planning

For two of Europe's largest river systems, the Danube and the Rhine, intergovernmental river basin Commissions have been established to coordinate policy and action within a common framework

River Danube

The International Commission for the Protection of the Danube River (ICPDR) was established in 1994 to ensure that surface waters and groundwater within the Danube River Basin are managed and used sustainably and equitably.

Photo: LIFE98 NAT/A/5422

Flooding of the Danube in 2002 near Vienna, Austria

To meet the framework water legislation, the ICPDR is developing a comprehensive management plan for the entire river basin. This process involves experts from industry and agriculture, representatives from environmental and consumer organisations as well as the local and national authorities. Its implementation follows the WFD timetable, i.e. it will be presented in draft form by 2008 and finalised by 2009. Thereafter, it will be updated every six years.

The management plan will include a general description of the characteristics of the Danube River Basin, a summary of significant pressures and impacts of human activities on the status of surface water and groundwater, a map of monitoring networks, a list of environmental objectives and a summary of the economic analysis of water use. For more information, visit the ICPDR website: *http://www.icpdr.org/icpdr-pages/river_basin_management.htm*

River Rhine

The governments of the five countries bordering the Rhine (Switzerland, France, Germany, Luxemburg and the Netherlands), have been working together since the 1950s to improve the water quality of the Rhine, which was chronically polluted by wastewater. For example, in 1986, a chemical spill severely poisoned the river and caused a massive death of fish between Basel and Koblenz.

The result of their joint actions, under the auspices of the International Commission for the Protection of the Rhine (ICPR), has been a significant reduction in pollutants (i.e. between 1985-2000 the point source input of most pollutants figuring on the 'list of priority substance' have been reduced by 70 to 100%).

In April 1999, this co-operation was reinforced with a new Convention on the Protection of the Rhine, its banks and its floodplains. In order to meet the obligations of the WFD, a Coordinating Committee Rhine & Water was formed between the five original countries, plus Italy. The task of the committee is to coordinate the implementation of the WFD in the Rhine river basin. On the basis of its natural features the Rhine River Basin District has been split up into the following sub-basins: Alp Rhine/Lake Constance, High Rhine, Upper Rhine, Neckar, Main, Middle Rhine, Moselle and Sarre, Lower Rhine, Delta Rhine. For more information, visit the ICPR website:
http://www.iksr.org/index.php?id=295

More information and copies of the WFD are available from the DG Environment website: *http://ec.europa.eu/environment/water/water-framework/index_en.html*

Integrated river basin management

The idea is that the most efficient model for a single system of water management is management by the river basin – the natural geographical and hydrological unit – rather than according to administrative or political boundaries. Initiatives taken, for instance, by the countries concerned for the Danube or Rhine river basins (see box) provide positive examples of this approach, with their cooperation and joint objective-setting across Member State borders, or as in the case of the Rhine, even beyond the EU territory.

Implementing the WFD

In order to assist WFD implementation, the EU Member States and the Commission developed the Water Framework Directive Common Implementation Strategy (WFD CIS), which was agreed in May 2001. In particular, Member States were encouraged to contribute to working groups responsible for developing analyses of pressures and impacts and best practice in river basin planning. Technical guidance from this process began to emerge from 2002 onwards. It is here that many LIFE projects have been particularly influential – promoting the key activities of the strategy, namely: the sharing of information; management of information and data; development of guidance on technical issues; and the application, testing and validation of guidance.

River basin management plans

The first river basin management plans must be published at the latest by 2009, and be submitted to the Commission within three months of their publication. These plans should provide a clear indication of the way the objectives set for the river basin (ecological status, quantitative status, chemical status and protected area objectives) are to be reached within the required timescale. They will include analyses of the river basin's characteristics, a review of the impact of human activity on the status of waters in the basin, estimation of the effect of existing legislation and the remaining "gap" to meeting these objectives; and a set of measures designed to fill the gap. An additional component is that an economic analysis of water use within the river basin must be carried out. All concerned parties should be fully involved in this participative process.

Due to the number of detailed provisions under the WFD, the Commission asked for groundwater protection and flood-risk management to be tackled separately under proposals for the following WFD 'daughter' directives.

Flood-risk management – proposal for a Directive on the Assessment and Management of Floods

Between 1998 and 2004, Europe suffered more than 100 major floods, including catastrophic floods along the rivers Danube and Elbe in 2002 ,

Photo: LIFE98 NAT/D/5372

Agile frog (Rana dalmatica) *an Annex IV species of Community Interest*

Healthy rivers hold high levels of biodiversity – River Mondego, Portugal

Photo: João Pedro Silva

Background to the management of Europe's rivers

floods that caused some 700 deaths, the displacement of about half a million people and resulted in economic losses totalling at least €25 billion (source: DG Environment website). More recently, the floods during the summer of 2005 caused widespread damage in Austria, Bulgaria, Germany, Moldavia, Romania and Switzerland. And in March 2006, heavy flooding forced thousands to evacuate their homes in regions and cities across central Europe.

Assets at risk from flooding include private housing, transport and public service infrastructure, commercial and industrial enterprises, and agricultural land. In addition to economic and social damage, floods can have severe environmental consequences, for example when wastewater treatment plants or factories holding large quantities of toxic chemicals are inundated. Floods can also destroy wetland areas and reduce biodiversity.

To address these problems, the Commission adopted a proposal in January 2006 (COM(2006)15) for a Directive on the Assessment and Management of Floods. Its aim is to reduce and manage the risks that floods pose to human health, the environment, infrastructure and property. The measure ensures a close link to the implementation of the WFD, providing for preliminary flood-risk assessments to identify the river basins and associated coastal areas at risk. For such zones Member States would need to draw up flood-risk maps and then flood-risk management plans focused on prevention, protection and preparedness.
http://ec.europa.eu/environment/water/flood_risk/key_docs.htm

Groundwater – a new proposal for a directive

In September 2003, the Commission adopted a proposal for a new directive to protect groundwater from pollution (COM(2003)550).

Photo: LIFE98 NAT/A/5422

Great White Egret (Egretta alba) *one of Europe's most graceful-looking birds*

Based on an EU-wide approach, the proposed measure introduces, for the first time, quality objectives, obliging Member States to monitor and assess groundwater quality on the basis of common criteria and to identify and reverse trends in groundwater pollution. The proposed approach to establishing quality criteria takes account of local characteristics and is in line with the requirements of the WFD related to the assessment of the chemical status of groundwater and the identification and reversal of significant and sustained upward trends in pollutant concentrations.
http://ec.europa.eu/environment/water/water-framework/groundwater.html

Other river-related European policies and directives

Closely linked to the WFD are the following other EU water-related directives:

- Nitrates Directive (91/676/EEC) – regulating against nitrate pollution of surface and groundwater due to diffuse fertiliser runoff from agriculture. Nitrate pollution promotes eutrophication, particularly in estuaries, and may exceed the thresholds for human consumption set by the Drinking Water Directive (80/778/EEC, revised as 98/83/EEC) which forms an integral part of the WFD.
- Urban Waste Water Treatment Directive (91/271/EEC) – regulating water pollution from urban wastewater and certain industrial sectors.
- Strategies against chemical pollution of surface water under the WFD [including Priority substances under Article 16 of the directive, as well as the existing legislation on the Discharges of Dangerous Substances Directive (76/464/EEC).
- The quality of bathing water in rivers, as well as in lakes and coastal waters is regulated by the Bathing Water Quality Directive (76/160/EEC) and the new Directive (2006/7/EC).
- Birds Directive (79/409/EEC), and Habitats Directive (92/43/EEC) – Article 6 of the WFD requires that a register of protected areas within each river basin district, including Natura 2000 sites.

LIFE and Europe's rivers

Launched in 1992, LIFE (The Financial Instrument for the Environment) is one of the spearheads of Community environment policy. LIFE co-finances environmental initiatives in the European Union, certain third countries bordering the Mediterranean and the Baltic Sea, and some EU candidate countries. The current LIFE programme[1] is divided into three thematic components: LIFE-Nature; LIFE-Environment; and LIFE-Third Countries. To date, the programme has co-financed some 2,750 projects with a budget of over €1.6 billion.

Photo: LIFE98 NAT/D/5372

Beaver (Castor fiber) *an Annex II Habitats Directive species targeted by several LIFE river projects*

Since 1992, LIFE has co-funded more than 150 river-related projects across the nature, environment and third countries' strands. As the pie chart opposite shows, almost two thirds of these projects have been orientated towards nature conservation, reflecting the biodiversity value of river habitats and associated species within the Natura 2000 network of sites. The majority of the 150 projects focus on the restoration and management of riverine ecosystems and almost half of the LIFE-Environment projects are indirectly linked with the implementation of River Basin Management Plans in accordance with the WFD.

LIFE-Nature and LIFE-Environment case studies

The case studies featured in this publication have been selected as successful examples of projects illustrating LIFE's contribution to seven river and river management themes:

- LIFE and river basin management – Water management at the scale of the river basin (LIFE98 ENV/FIN/573); Practical implementation of river management (LIFE99 ENV/E/278).
- Protecting riverine habitats and species – Restoring the natural dynamics of a Danube floodplain area (LIFE98 NAT/A/5422); LIFE safeguarding Natura 2000 rivers

1 A new LIFE+ programme will shortly replace the LIFE programme. The LIFE+ Regulation covering the period 2007-2013 is expected to be adopted in June 2007.

(LIFE99 NAT/UK/6088); LIFE actions to aid endangered freshwater fish gizani.

- Rural and urban solutions – River management in the West Midlands (LIFE02 ENV/UK/144); A community approach to cleaning up an estuary (LIFE00 ENV/UK/894); Restoring river ecosystems (LIFE99 ENV/E/347).
- Monitoring the status of EU Rivers – Ecological quality assessment based on the fish populations of the Meuse (LIFE97 ENV/B/419); Implementing a common approach to river management in Northern Europe (LIFE99 ENV/NL/263).
- Improving the status of European Rivers – Establishing a Centre for River Restoration (LIFE99 ENV/DK/619); Restoring the River Inn's hydrological dynamics and floodplain habitats (LIFE98 NAT/D/005372); Aiding migration of endangered fish in the Danube (LIFE99 NAT/A/6054).
- Reconnecting rivers and floodplains – Restoration of habitats and wildlife of the River Skjern (LIFE00 NAT/DK/7116); Flood management and ecological restoration in the Dijle valley (LIFE98 NAT/B/005171); Restoration of habitats and wildlife of the River Skjern (LIFE00 NAT/DK/7116); Integrated development and management of the Saône Valley (LIFE97 ENV/F/194).
- Stakeholder participation – Wise use of floodplains (LIFE99 ENV/UK/203).

Photo: João Pedro Silva

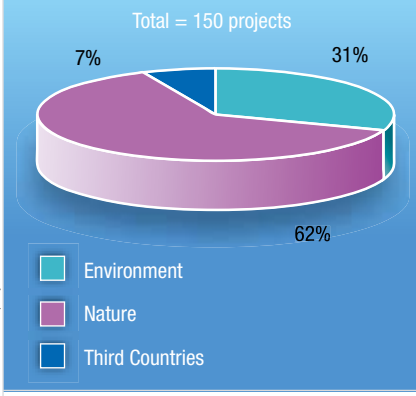
LIFE in action: Georg Frank, project manager of the Austrian Danube river banks' project (LIFE02 NAT/A/008518)

The projects chosen to illustrate the themes represent a very small sample of the many LIFE projects, which since 1996 have addressed issues at the scale of the river basin. As well as the 150 or so LIFE projects directly concerned with river restoration or management issues, there are scores of other LIFE-Environment and LIFE-Nature projects, that have indirectly targeted WFD issues – covering, for example, the two WFD 'daughter' directives concerned respectively with flood protection and groundwater, or other associated legislation such as the Nitrates (91/676/EEC), Birds (79/409/EEC), Habitats (92/43/EEC), Urban Waste-water Treatment (91/271/EEC) and Drinking Water (80/778/EEC) directives.

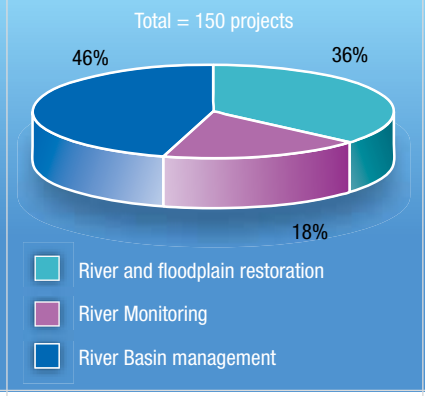
Ahead of the transposition of the WFD into national law (end of 2003), LIFE was one means of co-funding projects in pilot river basins under the Common Implementation Strategy (which was agreed in 2001). Such initiatives played an important role in providing the necessary tools for testing the guidelines for the implementation of the WFD and associated legislation. Following on from this, the task then for LIFE project beneficiaries and their partners was to gather expertise and experience to help develop and implement the measures and best practice guidelines required to meet the objective of 'good status' for all European surface- and groundwater by 2015.

For further information, see the LIFE website: *http://ec.europa.eu/life/*

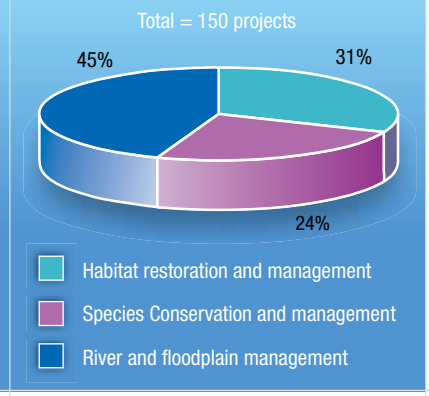
LIFE river projects (1996-2006) by thematic category



LIFE-Nature river projects (1996-2006) by approach



LIFE-Environment river projects (1992-2006) by approach



Source: LIFE projects database

LIFE and Integrated river basin management

The river basin is at the heart of the WFD. It is the basic unit around which all water planning and management actions are implemented and reflects the fact that water respects physical and hydrological boundaries, rather than political or administrative boundaries. The Directive calls on Member States to implement River Basin Management Plans at the latest by the end of 2009 – with the overall environmental objective of achieving "good status" for all of Europe's rivers by 2015. In order to assist WFD implementation, and specifically to meet the 2009 target, the LIFE programme has been co-funding projects that support the elaboration of integrated river basin management.

Finland: Water management on the scale of the river basin

Finnish rivers are some of the least polluted in Europe. However, their value for recreational use has deteriorated over the past decade despite preventative action. One of the reasons for this decline is the lack of an integrated approach to water pollution control. The RiverLIFE project, which was undertaken by a consortium of specialist organisations, developed cost-effective and practical tools using an interactive computer-based decision support system for sustainable river basin management.

All land-uses (agriculture, forestry, peat production etc.) have some environmental impact on a river's ecosystem, be it through the loading of suspended solids, nutrients, metals and acidifying substances. If these detrimental effects are to be limited, the river basin has to be considered as a whole and better use made of existing water pollution control methods, for example, sedimentation basins, buffer zones and wetlands. General environmental awareness on behalf of the public also has to be increased so the value of these solutions is understood.

The River Kyrönjoki, one of the pilot river basin sites

The RiverLIFE project was developed by a consortium with experience in environmental modelling and development of computer-based user interfaces. The consortium was led by the North Ostrobothnia Regional Environment Centre (NOREC), the project beneficiary. The project's main purpose was to create cost-effective, practical tools for sustainable river basin management, using an interactive computer-based decision support system (DSS).

What did LIFE do?

The system was tested and demonstrated in three pilot rivers: Siuranjoki, Simojoki, and Kyrönjoki. Such testing enabled the project team to fill in gaps in existing knowledge on water pollution control of rivers and river status assessment, and to draw up guidelines for cost-effective and adequate monitoring procedures in line with the WFD. The information gained was used to promote more effective pollution control and ecological beneficial land-use by various target groups from decision-makers to school children through a website.

The project achieved its principal objective of developing DSS tools for the management of a river basin. The system was developed in three languages (Finnish, Swedish and English) and was designed to be easily transferable to other EU countries. Wide dissemination was also carried out through conventional means (articles, seminars, conferences etc) as well as through the project website (see address below), project publications and a video.

What was the outcome?

The testing of the project methodology resulted in the development of specific follow-up proposals for ecological monitoring, management and pollution control in the three river areas, and the drawing up of general guidelines for river basin management. In one of the areas: the River Kyrönjoki, a national pilot river basin site for implementing the WFD, a plan for ecological management and monitoring was drawn up and an automated river monitoring and control system tested. This system provides continuous, detailed information on water chemistry and hydrology, enabling the authorities to respond quickly to any deterioration in water quality by adjusting the river flow.

Life after LIFE

A follow-up study of the project was carried out in January 2007 by the LIFE external monitoring team. It showed that the experience and results from the project have been extensively used since the end of the project six years ago. Notable examples include: the "Kola River Quality" research project (EU Fifth Framework Programme - FP5) to develop water pollution control at the Kola river basin in north-west Russia; the PRIMROSE project 2001-2003 (EU FP5); and the WATERSKETCH project 2004-2007 (EU Interreg IIIb Baltic Sea Region Programme). All these projects used or built upon the DSS tools and experiences from the LIFE project. Certain aspects of RiverLIFE were also included in another very successful LIFE-Environment project led by the same beneficiary, Bothnian Bay LIFE (LIFE00 ENV/FIN/646)

The implementation of the WFD on watercourses has also benefited from the RiverLIFE results and tools, especially in the classification of the water bodies.

Following project closure in August 2001, the Finnish environmental administration has established a separate river ecology unit in Oulu (the location of the RiverLIFE beneficiary). Key staff members from the earlier LIFE project are now involved with this new unit.

The project findings have been widely disseminated. Among several conference and seminar presentations, the results were presented at the Pilot River Basin Workshop (Annual Review and Research & Technology Integration) held on 4-5 October, 2004 in Ghent, Belgium. After the event, the following paper was published: "The RiverLife project and implementation of the Water Framework Directive" (Karjalainen, S.M. & Heikkinen, K. 2005). Environmental Science &

The River Oulujoki, the location of 'Life after LIFE' activities

Policy 8: 263-265. The above-mentioned Bothnian Bay LIFE project was also presented at this event.

Finally, a geographic information system (GIS) tool from the RiverLIFE DSS toolbox is set to be used in the near future for practical water pollution control work at the Forestry Centres and the Forestry Development Centre (Tapio) in Finland. This will increase the cost-effectiveness of water pollution control planning in forestry, which in turn should result in better status of watercourses in the north of the country. This will help to increase environmental awareness of the environmental impacts of land use derived from diffuse source loading.

Project Number:
LIFE98 ENV/FIN/573

Title:
A cost-effective decision support system for management of boreal river basins

Beneficiary:
North Ostrobothnia Regional Environment Centre, Finland

Contact: Mrs Satu Maaria Karjalainen or Dr Kaisa Heikkinen

Email:
satu.m.karjalainen@ymparisto.fi, kaisa.heikkinen@ymparisto.fi

Website:
www.ymparisto.fi/riverlife

Period:
01-Sep-1998 to 01-Sep-2001

Total Budget: € 845,000

LIFE Contribution: € 412,000

Spain: Practical implementation of river management

Well ahead of the EU Water Framework Directive's 2009 deadline for the development of river basin management plans, a Spanish LIFE project has successfully developed a sustainable management plan for the Guadajoz River basin. This now serves as a useful example of the practical implementation of river management.

River management has to resolve conflicting interests of the major stakeholders operating in the Guadajoz River basin. The challenge for this LIFE project was to bring together all sectors of the local community to draw up a set of integrated policies for the sustainable development and environmental management of the river and its surroundings.

The Guadajoz River is one of the biggest tributaries of the Guadalquivir, which flows down to the Vadomojón Dam. Several small towns – Baena, Castro del Río, Espejo, Nueva Carteya and Valenzuela – are located in the river basin area, which has a population of 40,000 and extends over 700 km^2. The beneficiary, "Mancomunidad de Guadajoz y Campiña Este de Córdoba", the region's municipal association, was founded in 1993 with the main objective of fostering social and economic development in terms of the sustainability of the river's resorts.

Environmental river management in Spain

Photo: D. Renders

What did LIFE do?

The project:

- Promoted the creation of political and technical structures that are useful for the planning and integrated management of river resources – building necessary capacity;
- Developed systems to improve the natural environment, including demonstrating initiatives to combat erosion and control water quality, sponsoring training initiatives and fostering agreements with farmers and industries;
- Involved the whole local community through awareness-raising educational campaigns and the introduction of new economic activities that are compatible with river conservation;
- Developed an integrated model of environmental management in the Guadajoz River zone that is potentially applicable to similar areas of southern Europe.

What was the outcome?

The Guadajoz project has had a significant impact on the Guadajoz river basin. It has introduced institutional coordination, technical innovation and social participation, which has resulted in an integrated model for the environmental management of the river basin. The setting up of a "River Board" allowed the institutions and organisations that operate in the river area to work together towards sustainable development. Joint initiatives are ongoing.

The project has helped the region meet the requirements of the WFD. It has analysed the environmental problems the river faces and devised solutions for combating them. Several techniques have been tested including: erosion control; improvement of water quality; monitoring; definition of 'ecological' flow levels; and restoration of natural vegetation. Effective techniques were also established for regenerating different areas of 'run down' or unmanaged riverside habitats.

The most important impact of the project, however, was the creation of a foundation for a follow-up, EU co-funded programme. This initiative will have a total budget of over €100 million and will introduce additional restoration actions in the Guadajoz river basin and its surrounding environment.

Project Number:
LIFE99 ENV/E/000278

Title:
River agreements – design & implementation of fluvial management policies

Beneficiary:
Mancomunidad del Guadajoz y Campiña Este de Córdoba, Spain

Contact: Luis Moreno Castro

Email:
apdgycec@spa.es

Period:
15-Oct-1999 to 15-Apr-2003

Total Budget: € 521,000

LIFE Contribution: € 494,000

Protecting riverine habitats and species

Rivers are one of the most important types of European ecosystem, home to many species and habitats. They also provide vital ecological functions, besides their most obvious role as natural drainage channels (such as purifying water, and moderating floods and droughts). The LIFE programme supports the conservation and restoration of river species and habitats fulfilling the requirements of the EU Habitats Directive (92/43/EEC) and Birds Directive (79/409/EEC). At the same time it helps develop means of delivering the implementation of the WFD.

Austria: Restoring the natural dynamics of a Danube floodplain

The River Danube has been an important international waterway for centuries and remains so today. Managing the Danube and its main tributaries to facilitate navigation has, however, radically changed the physical and ecological characteristics of the waterway. Consecutive flood alleviation and navigation improvements have restricted spillage into the floodplain. This LIFE project helped to restore more natural dynamics to the Danube floodplain system to the east of Vienna, aiding the conservation of habitats and species dependent on a more natural river flow.

Originating in the Black Forest in Germany and flowing eastwards for a distance of 2,850 km into the Black Sea, the Danube is the longest river in the European Union and Europe's second-longest (after the Volga). The Danube is characterised by fluctuating (seasonal) fast-flowing waters and regular flooding. Its basin encompasses high population densities and supports important economic activities. It is an important transport route, classified as a "Transport Corridor VII" under the EU's Trans-European Transport Network. In order to regulate the flow and facilitate navigation, the river banks were heavily modified. Restricting the movement of water between the main river channel and the adjacent floodplain has had navigation and other economic benefits, but also has had negative impacts on floodplain habitats and species.

The Donau-Auen National Park, east of Vienna in Austria, covers a total area of 10,000 hectares and includes a 36 km reach of the Danube. Included in the Natura 2000 network, it is one of the last major floodplain areas in Europe and one of the largest and best preserved regions of lowland riparian forest in Central Europe. The national park was created in 1996, to conserve the floodplain. It followed an awareness-raising campaign that started with the occupation of the wetlands near Hainburg in December 1984 in order to prevent the construction of a hydro-electric power station.

Photo: Kovacs

The impact of erosion after opening of the riverside branches (white area corresponds to new gravel areas)

The former flooding regime of the Danube favoured an extreme range of water level conditions, with associated high biodiversity. However, the river's hydro-dynamics were affected by the construction of several kilometres of flood-alleviation embankments and navigation structures, such as weirs, along the course of the river, which resulted in changes in the river's natural course (with meanders and branches straightened and re-directed). This disconnection between the river and its floodplains and consequent alteration of the duration and frequency of flooding, had caused the drying up of former wetlands. Some stakeholders wanted to have river water back on to the floodplain periodically, for a number of reasons.

What did LIFE do?

Prior to the launch of the LIFE project in 1998, the plan to reconnect the various river branches and meanders had already been drawn up. The LIFE programme provided the opportunity to start the process of restoring the river/floodplain dynamics of the National Park. LIFE co-funded the reconnection of several cut-off side channels to the main river at Orth and Schönau. Stone block embankments and towpaths (no longer used) were blocking the natural flow of water into these Danube riverside branches, resulting in the near local extinction of certain habitats and species.

This reconnection was achieved by lowering the cut-off side channels relative to the main river and changing existing weirs to bridges to permit flow out of the main channel into the adjacent forests and former side channels. The objective was to restore a more natural sediment transport system with acceptable and manageable erosion and deposition.

The reconnection dispersed river water during flood events and helped to alleviate flooding in Vienna.

In order to monitor the erosion/deposition process and to chart reappearing habitats, a monitoring tower was installed by the project team. Equipped with a remote camera it tracked the dynamic process over the three-year project period. The tracking tower is still functioning today.

The increased flow of water into the floodplain favoured water-dependent species such as the European Mud-minnow *(Umbra krameri)*[1] which was considered extinct in Austria until its rediscovery in 1992. The project actions concerning this species consisted of habitat improvement (restoring ditches and digging 'survival ponds' at 16 sites around Orth) and the successful re-introduction of more mud-minnows. The project also implemented a plan for the management of meadows in the "Lower Lobau" (Viennese part of the National Park). This benefited the conservation of the corncrake *(Crex crex)* in particular.

In addition, the project constructed six new gravel islands in the main channel of the Danube and reshaped the riverbanks. Gravel habitats, which were once abundant in the Danube, had almost disappeared as a result of river regulation.

Concerning communication and dissemination activities, the beneficiary carried out substantial media work about the LIFE project, including the publication of a National Park newspaper ("Aublick") four times a year. Other activities included the development of a website (which remains open at the address below) the hosting of information seminars and presentations to local schools. The project also established an extensive national and international (Slovakia, Germany, Hungary, Romania, Bulgaria) network to promote the innovative side channel re-connection work, the results of which are potentially of interest and transferable to other river engineering projects.

Another key achievement was the development of a concept based on the hydrological restoration experiences of the work carried out in the National Park area. This involved a more 'holistic', or less interventionist, approach to river renaturalisation by encouraging less heavy engineering work. As Project Manager and National Park Director Carl Manzano explains: "Instead of carrying out heavy engineering work, we encouraged the river to work for itself."

1 Species included on the Annex II of the Habitat Directive (92/43/EEC)

Original site (top left), stone embankment removal (top right), after the machinery (bottom left), and the effects of erosion (bottom right)

What was the outcome?

A result of the LIFE project was the transfer of experiences to a second, follow-on LIFE project, (LIFE02 NAT/A/008518 - Restoration of Danube river banks) focusing on restoring river banks to a semi-natural state. Based on the premise of allowing the river to work for itself, the follow-on project implemented an ambitious restoration plan focusing on the restoration of the floodplain Danube dynamics, which is characterised by the erosion and deposition process.

One of the key actions of the follow-on project was the removal of all artificial elements strengthening the banks of a three kilometre pilot section along the left bank of the Danube opposite the town of Hainburg, so that erosion and accretion processes could generate a natural river bank structure. The effects of the action, involving the removal of more than 50,000 m^3 of stones and boulders, have been impressive: the subsequent regeneration of the erosive river side bank process and inflow of water to the floodplain exceeded all expectations.

The erosion of the river bank was more intense following the 2002 Danube flooding (more than 30 meters inland), with a recreation of a new gravel bank of more that 300 meters in length (see pictures). This new river area and bank aided the flood water to disperse. The action has also contributed to the flood protection of Hainburg and of the city of Bratislava in Slovakia.

Another key action of the second project has been the removal of 36 dykes on the Orth floodplain, which were constructed for forest roads (three times more than the initial LIFE project proposal). This has resulted in more natural water flow between the river side branches renovated under the first LIFE project. This measure had an additional positive effect of reducing the human disturbance on the floodplain, especially for sensitive species.

Benefiting habitats and species

Both LIFE projects' actions caused direct and indirect improvements on the river and floodplain habitats and species, especially those directly linked with river dynamics. Some had not been present in the pre-restored the area. For example:

- the increased gravel banks[2] area provided nesting and feeding sites for the common sandpiper (Actitis hypoleucos) and little-ringed plover *(Charadrius dubius)*;
- the kingfisher *(Alcedo atthis)*[3] benefited from the increased availability of nesting sites resulting from the newly eroded river side banks. As a result, the National Park has one of the highest number of breeding pairs in Austria;
- the beaver *(Castor fiber)*[4], reintroduced into the park 30 years ago, is locally widespread, and now has more available habitat and burrow sites, it is actively using the reconnected river side branches;
- the reduction of human disturbance resulting from the removal of the forest roads, is contributing to the preservation and probably increased breeding of endangered birds such as the black stork *(Ciconia nigra)* and the white-tailed eagle *(Haliaetus albicilla)*.

Life after LIFE

Georg Frank, Project Manager of the second LIFE project, explains that originally more than 90% of local people were afraid of, and therefore against, a more ambitious restoration project, because they feared the actions of opening the dykes would increase flood-risk. "But once they saw the results of the introduction of the measures they were asking for more". This request is already being met by an ambitious new project steered by the Danube's navigation authority – "Integrated River Engineering Project on the Danube" – targeting the restoration of the National Park floodplain and meeting the nautical requirements of this section of the Danube.

2 Habitat included on the Annex I of the Habitats Directive: Alpine rivers and their ligneous vegetation with Salix elaeagnos (3240)
3 Species included on the Annex II of the Birds Directive (79/409/EEC)
4 Species included on the Annex II of the Habitat Directive (92/43/EEC)

A sandpiper's (Actitis hypoleucos) *nest camouflaged in the newly formed gravel banks*

Project Number:
LIFE98 NAT/A/5422

Title:
Restoration and management of the alluvial flood plain of the River Danube

Beneficiary:
Eesti Energia AS (EE AS)

Period: 01-Jul-1998 to 31-Mar-2004

Total Budget: € 2,822,000

LIFE Contribution: € 1,411,000

Project Number:
LIFE02 NAT/A/8518

Title: Restoration of Danube river banks

Beneficiary:
Nationalpark Donau-Auen, Austria

Contact: Carl Manzano

Email: national@donauauen.at

Website:
www.donauauen.at

Period:
01-Jul-2002 to 30-Jun-2006

Total Budget: € 1,778,000

LIFE Contribution: € 711,000

UK: LIFE safeguarding Natura 2000 rivers

This influential United Kingdom LIFE-Nature project developed a set of tools to help protect riverine Natura 2000 sites. It developed conservation strategies for seven UK river SACs (Special Areas of Conservation). Ecological management and monitoring protocols were developed for 11 species, and a range of publications was produced on conservation techniques. The project also established local stakeholder groups that have proved to be sustainable and active. Crucially, the project created a model for developing similar strategies elsewhere.

Photo: Paul Glendell/Natural England

Otter (Lutra lutra) *an Annex II habitats Directive species targeted by this LIFE project*

The management of river systems with high conservation value is a complex and challenging task. River habitats and species can be vulnerable to a wide-range of man-made pressures. Many rivers deemed to be of importance at a European level for their conservation value have been degraded. Arguably, compared to other habitat systems, relatively little is known about the ecological dynamics and requirements of river habitats and the species that live in them.

The project was implemented by a partnership of government agencies responsible for water quality and the protection of fresh water habitats. Led by English Nature, the project beneficiary, the primary objective was to develop river conservation strategies and management plans under the terms of the EU Habitats Directive for seven SAC rivers. Together, totalling around 872 km, they harbour 13 Annex I species including the otter *(Lutra lutra)*, white-clawed crayfish *(Austropotamobius pallipes)*, salmon *(Salmo salar)* and freshwater pearl mussel *(Margaritifera magaritifera)*. They also represent a cross-section of different

Protecting riverine habitats and species

land-uses, socio-economic users and threats associated with rivers in the UK and parts of Europe.

The project has provided a mechanism for initiating conservation actions along each river, in agreement with the local authorities, user groups and landowners. It has also created a model for developing similar strategies on the other pSCI (proposed Sites of Community Importance) rivers in different parts of the UK.

What did LIFE do?

First, it was important to understand the ecological requirements of the Annex I animals and plants. Conservation objectives were planned and developed for each species and habitat type. This was supported by practical experiments such as breeding trials of freshwater pearl mussels, the reintroduction of freshwater crayfish into one river, otter studies and vegetation control for the benefit of fish populations. Ultimately, the project aimed to develop techniques for addressing key issues associated with river conservation and demonstrate best practice that could then be widely disseminated within the UK and other Member States.

What was the outcome?

The project successfully developed river conservation strategies/management plans for all seven SAC rivers. Reports on the ecological requirements of the targeted species and habitats were published. Monitoring protocols were also produced to allow assessment of the conservation status of the species and habitat targeted by the project. In addition, the project identified a number of obstacles to conservation objectives and produced publications to address these issues.

Life after LIFE

A follow-up study of the project was carried out in January 2007 by the LIFE external monitoring team. It showed that following project closure, at the end of 2003, activities and meetings related to dissemination continued throughout 2004, and additional funding was provided by the beneficiary for the printing of extra copies of the project publications. Demand for these studies continues to be high.

Practical restoration measures that were identified by the project are now being implemented at one of the

Seven SAC rivers targeted by the project

project sites on the River Avon, under the guidance of the STREAM project (LIFE05 NAT/UK/143). Some of the staff from the LIFE in UK rivers project are working on this project.

Finally, work identified by the project is ongoing at all seven selected rivers and is supported by the local stakeholder networks and, where possible, by the beneficiary's own staff. The Eden Rivers Trust in Cumbria has provided some further funding for ongoing work.

Examples of the reports on the ecological requirements of rivers species

Project Number:
LIFE99 NAT/UK/6088

Title:
Safeguarding Natura 2000 Rivers in the UK

Beneficiary:
English Nature, UK

Contact:
David Withrington

Email:
david.withrington@english-nature.org.uk

Website:
http://www.english-nature.org.uk/LIFEinUKRivers/index.html

Period:
01-Aug-1999 to 31-Dec-2003

Total Budget: € 2,241,000

LIFE Contribution: € 1,120,000

Greece: LIFE actions to aid endangered freshwater fish – gizani

In this successful Greek pilot initiative, LIFE-Nature funds were allocated for management actions to conserve an endemic priority freshwater fish species – gizani. The project's value lies not only in the protection of this endangered fish, but also on its implications for the conservation and management of streams with intermittent flow.

Gizani *(Ladigesocypris ghigii)* is an endangered endemic freshwater fish found exclusively in streams, springs and reservoirs of the Greek island of Rhodes. It prefers slow waters, staying close to the banks among roots of trees, bank cavities, vegetation and dead segments of the stream that form its favourite niches. In these habitats, the water supply and the environmental conditions fluctuate markedly, especially during the dry season, as a result of natural and human causes. Their diet consists of small aquatic insects, insect larvae, invertebrates and plant material. Its lifespan in nature is estimated to be up to three years, and it reaches maturity at the end of the first year of life. The gizani is one of the most endangered European fresh water species and is included as a priority species in Annex II of the EU Habitats Directive.

Gizani (Ladigesocypris ghigii) *a priority species in Annex II of the Habitats Directive*

The main threat for the species is the lack of sufficient quantities of water in the dry season, due to low levels of rainfall and to water abstraction for domestic consumption (notably during the peak tourism months) and irrigation. Habitats have also often deteriorated, but to a much lesser degree, due to pollution of water sources and to interventions in the stream banks, for example, waste disposal and gravel and sand collection. Competition with non-native fish introduced by humans is also a threat locally.

What did LIFE do?

The 57-month project was launched in February 1999. It was led by Greece's National Centre for Marine Research (NCMR), the beneficiary, and also included the collaboration of the South Aegean District Authorities and the municipalities of Arhagellos, Kamiros, Kallithea and Southern Rhodes. It included the following main project actions for the conservation of gizani at two Natura 2000 sites:

- Research to collect data for the sustainable management of the species;
- The establishment of a fish refuge for the conservation of the gizani population;
- Artificial reproduction to increase knowledge of fish breeding in order to be able to produce artificially large numbers of offspring for stocking;
- The creation of fish stocks to preserve the genetic diversity of the species;
- Public awareness raising and support for the conservation of this unique fish and its habitats; and
- The setting up of conservation and information centres – to host gizani stocks and to increase public awareness.

In dry periods the fish instinctively concentrate in pools, formed usually

on the banks of a stream where the water is deeper. During the summer, most of these pools are cut off from the stream (either because it dries up locally or because its flow decreases so much that they are not supplied with water) and the fish become trapped. As the main threat faced by gizani is summer water abstraction, a fish refuge was constructed on the banks of the Loutanis stream. The refuge ensures direct water exchange and free movement of the fish to and from the stream. It is constructed in such a way to maintain water even during the dry summer months.

A considerable number of awareness-raising actions were also undertaken by the project. These included the hosting of a workshop in October 2003 on "Mediterranean stream fish ecology and conservation" in Rhodes. Talks were also held with the authorities and the local communities concerned, and articles were published in the national and regional media. Project deliverables included a number of printed and electronic publications, which can be downloaded from the project's excellent website (published in Italian, Greek and English).

What was the outcome?

The project met its overall objective to aid the recovery and conservation of gizani populations at two Natura 2000 sites. The project's findings have significantly increased the knowledge of the species' distribution. In addition to the population nuclei already known at project launch, four new sites (containing six new populations in other streams) were identified and put forward to the Greek authorities as proposed Sites of Community Interest (pSCIs).

The species' conservation also proved to be a catalyst for the discussion of water management on the island. The beneficiary managed to bring together various stakeholders (local and regional authorities, hoteliers and the tourism sector farmers' associations, etc.), and involve them in the development and support for the species' action plan.

Particularly noteworthy was the successful strategy of combining the areas where breeding stocks were kept with public awareness initiatives. For example, the Eleoussa reservoir, which contains a sub-population no longer found in the wild, was provided with an information site, equipped with a small kiosk and a touch screen info-point for visitors.

Life after LIFE

A post-project follow-up study of the project was carried out in January 2007 by the LIFE external monitoring team. It concluded that the LIFE project significantly improved the chances of survival of the key populations of the target species in two Natura 2000 sites, and guaranteed the species' survival ex-situ through the creation of breeding stocks that can be used for re-introduction.

An important outcome of the project was the development of the gizani action plan. This plan is the first of its kind developed in Greece for a freshwater fish and includes important recommendations for the implementation of the WFD. According to the study, the plan has been distributed to all the local authorities on Rhodes dealing with water management. To date, the action plan has not been formally adopted. However, the beneficiary is continuing to push for implementation of its actions and to provide advice on the protection of the new pSCIs.

Finally, the fish refuge established under LIFE is still being maintained by local authorities. Lush vegetation has developed in the refuge, which is a good source of food for the fish. In addition, water turtles and eels have been observed, indicating that this part of the system is naturalising in character and is providing broader biodiversity benefits. This type of refuge, the first of its kind in Greece, has a high demonstration value.

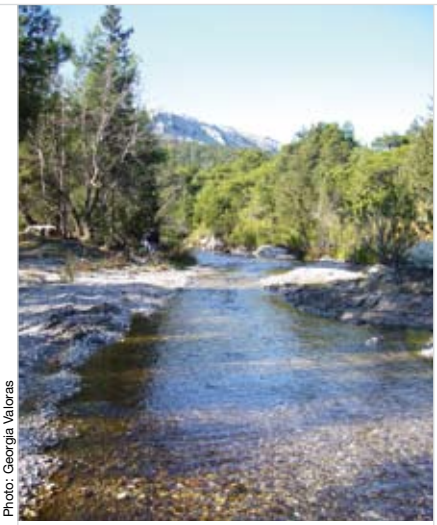


Photo: Georgia Valoras

View of the Loutanis stream, the natural habitat of the gizani

Psinthos schoolchildren visit the Fassouli gizani centre

Project Number:
LIFE98 NAT/GR/005279

Title:
Conservation measures for the endangered fish *Ladigesocypris ghigii*

Beneficiary:
Hellenic Centre for Marine Research, Institute of Inland Waters, Greece

Contact: Maria Stoumboudi

Email:
mstoum@ncmr.gr

Website: www.life-gizani.gr

Period:
01-Feb-1999 to 31-Oct-2003

Total Budget: € 833,000

LIFE Contribution: € 625,000

Heavily modified rivers: rural and urban solutions

The urban and rural rivers around Europe can have high concentrations of pollutants, as a result of industrial and domestic discharges and intensive agricultural techniques. Also, the ecological status of rivers can be constrained by physical modifications, such as straightening or deepening. A number of LIFE projects have contributed to the implementation of the WFD by demonstrating innovative means to reduce pollutants reaching rivers. For example, LIFE has co-funded projects developing best practice criteria for dealing with effluent resulting from agriculture (wine, olive oil, livestock, etc). Such projects are indirectly also aiding the implementation of the WFD, as well as fulfilling the requirements of associated river-related Directives.

UK: River management in the West Midlands

BEST PROJECTS AWARD 2006-2007

The award-winning SMURF project in the West Midlands, England, demonstrated a computer modelling diagnostic approach to river management as well as the benefits of engaging the local community in measures to improve the River Tame.

The large West Midlands conurbation, including the city of Birmingham, is in the a 1,515 km^2 catchment area of the River Tame, a tributary of the River Trent. The Tame basin is mostly industrial and home to 1.8 million people. The river suffers from industrial pollution, damaged habitats and poor accessibility. It has also been extensively modified and re-routed.

What did LIFE do?

The three-year LIFE project, Sustainable Management of Urban Rivers and Floodplains, applied sustainable land-use planning and water-management techniques to tackle the problems commonly associated with urban rivers. In 2002, the beneficiary, the UK Environment Agency, began to involve the public in the development of a vision for river management, which could be applied to a demonstration reach of the River Tame in the later stages of the project.

Actions taken at the stretch of the river Tame at Perry Hall demonstrated the benefits of 'opening up' the river to the public

While two sites were initially selected for demonstration purposes, focus centred on a stretch of the River Tame that circles the Perry Hall sports fields. Here, the banks of the river have been raised as part of an existing flood-management plan that contains floodwater on sports

grounds. Accessibility to the river, however, is compromised, and offers limited amenity.

Three groups were set up in the first phase of the project for two rounds of evening meetings to develop the vision for river management for all rivers in Birmingham. Mr Mark Scott of the Environment Agency says: "A specific part of the project was to find out how the community felt, and the three groups came together one Saturday to arrive at an overall vision." This part of the project was coordinated with Birmingham University, which also gave participants a tour of the city's rivers. "Many people didn't know how many rivers the city had," says Mr Scott. A further single group was set up specifically for the demonstration scheme at the Perry Hall sports fields.

What was the outcome?

Interest in the project was high, and suggested measures included the construction of a gravel path alongside the river, the location of rubbish bins to prevent littering, and the recreation of riverside habitats through the lowering of the banks at certain points to be planted with reeds and wild flowers.

Mr Scott says that the University will conduct a follow-up study of the area to determine what effect the project has had on the river habitat. The aim of the project at Perry Hall, however, was social as well as ecological. Measures taken during the project open up the river to people and their pets. "Being able to watch your dog swim or families sitting down by the river is something that just didn't happen before the project," he says.

Even before display boards were put up providing information about the project, the local community were aware of the actions taken by the Environment Agency as part of the LIFE project. Schools trips have been made to the site, and school children along with more than 100 local residents helped plant wild flowers on a new patch of meadow created with earth taken from a bend in the river.

The banks of the river were lowered to allow the river to follow a more natural course

This bend has been reworked to allow the river to follow a more natural course, and Mr Scott is pleased that "the river has started to behave like a natural river". Unwelcome objects can be found in an urban river, however, and littering is now more visible. Mr Scott says that there have been some complaints, but he believes that such incidents constitute a positive sign. They are testament to a growing relationship between the local public and the management of its rivers. Such an increased awareness, Mr Scott believes, will lead to a greater responsibility among the community.

Life after LIFE

The overall legacy of the project is difficult to quantify, but the organisers believe its influence will be far-reaching. Since the project closed, the local council has provided the Perry Hall site with a park ranger, an appointment that could have resulted

from the heightened awareness the project generated. Moreover, the Birmingham City Council has "built on the project for its planning agenda on how to manage rivers and involve the community," according to Mr Scott.

The site also serves as an example of good practice that other councils can follow.

"Elements of the project are transferable," says Mr Scott, "and a lady from Prague attended two of our conferences and made a link with the part of the SMURF project developing the habitat assessment tool." The subsequent testing of the method in Prague would not otherwise have happened, says Mr Scott.

The project created a gravel path with benches and bins

The innovative river modelling aspect of the project is continuing to be evaluated. The system used during the project was a Geographical Information System (GIS), which links data to spatial information and can produce maps showing the data. While difficulties remain in applying this technology, Mr Scott says that the project "showed new things and improved the technology".

A full version of the system was delivered to the main project partners and requires specialist software, but two other less sophisticated versions – a CD-Rom and an online version – were made available to the public.

Community involvement was key to the success of the project, and SMURF can be seen as a case study of how you can use public participation to implement the Water Framework Directive. More information about the project was made available on the project's award-winning website. The user-friendly innovations of the site were recognised with a prize from the Royal National Institute of the Blind.

Finally, the project is one of 22 projects recognised in the "Best LIFE-Environment Projects 2006-2007" awards. This third review of completed projects funded through the LIFE-Environment programme, selects projects based on a number of best practice criteria.

Mark Scott of the Environment Agency (right) chats with a local volunteer at the Perry Hall park

Project Number:
LIFE02 ENV/UK/000144

Title: Sustainable Management of Urban Rivers & Floodplains

Beneficiary:
Environment Agency, UK

Contact: Mark Scott

Email:
mark.scott@environment-agency.gov.uk.

Website:
www.smurf-project.info/

Period:
01-Aug-2002 to 31-Jul-2005

Total Budget: € 3,027,000

LIFE Contribution: € 1,130,000

UK: A community approach to cleaning up an estuary

BEST PROJECTS AWARD 2005-2006

The Ythan project developed a long-term community-approach to improving the ecological status of the river, as well as implementing a range of measures to tackle pollution directly.

Photo: Natural England

The Ythan initiative – encouraging the local community to take responsibility for the state of the river

In recent years, levels of nitrates and phosphates have been steadily increasing in the Ythan river catchment in Aberdeenshire. The drainage of these plant nutrients into the river contributes to the increase in growth of green macroalgae in the estuary waters and has an overall negative impact on the availability of food for birds. Although the estuary site has Ramsar status (as designated by an international treaty for the conservation of wetlands), it is not adequately protected from the impact of activities upstream and pollution from adjacent sea areas. Additional designation as a Nitrate Vulnerable Zone will not protect the site from pollutants other than nitrogen (e.g. phosphorus and soil particles).

What did LIFE do?

As a result, this LIFE project was set up to encourage the local community to take responsibility for the state of the river and its surrounding habitats. Such an initiative is vital for the prevention of significant damage in future years.

Aberdeenshire Council, the project beneficiary, also aimed to introduce a raft of measures to reduce pollution and enhance the river's ecological status. These measures included:

- The use of a farm demonstration site to disseminate best practice, particularly to the local farming community;

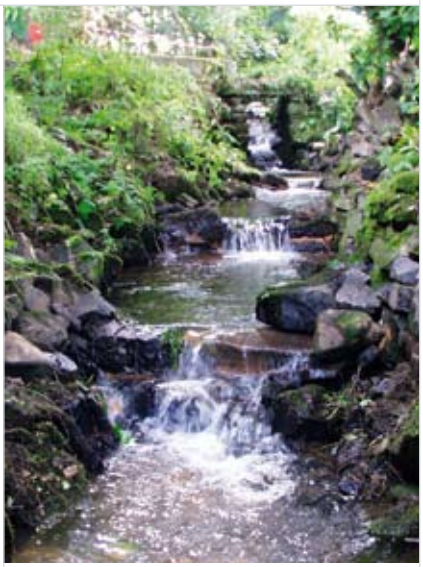


Photo: Tamsin Morris

A stepped fish pass installed to allow migrating fish access to upstream spawning grounds

- Working with local farmers to increase applications to agri-environment schemes, develop nutrient budgeting, produce water-management plans and encourage the use of buffer strips;
- Bringing together anglers, walkers, local residents and national agencies to select and manage restoration work on sections of the river to create areas of semi-natural habitats;
- Working with local residents and others to monitor changes in water quality and other indicators.

The project planned to encourage the application of innovative techniques to land management issues. It also aimed to undertake work to benefit Local Biodiversity Action habitats and species and to offer a way of linking up multiple agri-environment applications to achieve benefits for wildlife.

What was the outcome?

Forty-seven public events were organised, attracting a wide range of people from the local community and raising awareness of the environmental issues related to water management. The local community (supported by Scottish Environment Protection Agency staff) was also involved in the collection of water quality data over the three-year period of the project. Local people took part in water quality sampling at eight sites and in 50 river habitat surveys.

The Ythan floodplain after the clearing of conifer trees from the river banks

Photo: Tamsin Morris

Photos: Adrian Devonshire

Local people attend a river fun day as part of the Ythan Project (right), and project information panel (left)

Two demonstration farms were established to illustrate the benefits of agri-environment schemes and nutrient budgeting. Several tours of these farms were arranged for local farmers, who were also encouraged to take training courses on nutrient budgeting software designed by the University of Hertfordshire. More than sixty farmers took advantage of this opportunity and are likely to continue using the software. The process of nutrient budgeting highlighted the potential for an average 15% reduction in fertiliser use on the farms.

Farmers were also encouraged to join the Rural Stewardship Scheme and at the end of the project more than 70km of buffer strip had been established. Water sampling data indicates a reduction in suspended solids in neighbouring streams. The project also worked with farmers to produce water management plans for farms adjacent to water courses (more than a hundred water management plans were drawn up).

For direct river enhancement interventions, the local community helped select sites including a large forestry project at Gight Woods in Methlick, where a mono-species stand of coniferous trees was removed and replaced by more than two thousand broad-leaved trees. Estuary monitoring work was also carried out using four sets of aerial photographs (collected in August each year). One set of satellite imagery was collected for comparison. Bird counts were conducted every two weeks for two years. Two social surveys were carried out, at the beginning and end of the project, in the Ythan catchment and in comparison catchments in north-east Scotland. These surveys assessed peoples' attitudes to the project and to water management.

To distribute the results of the project, a website was created and dissemination materials were published. The project also hosted a major conference in October 2004.

Project Number:
LIFE00 ENV/UK/000894

Title:
Sustainable land management in the Ythan catchment

Beneficiary:
The Ythan Project, c/o Aberdeenshire Council, UK

Contact: Tamsin Morris

Email:
tamsin.morris@sepa.org.uk

Website: www.ythan.org.uk/

Period:
01-Aug-2001 to 28-Feb-2005

Total Budget: € 737,000

LIFE Contribution: € 358,000

Spain: Restoring river ecosystems

In Spain, since the 1950s, the damning of many rivers to produce hydroelectric power had a negative impact of the spawning success of migratory fish species. A LIFE project aimed to restore the ecosystem upstream of the Frieira Dam on the Miño River in Galicia.

Completed in 1970, the 33 metre-high Frieira Dam had a clear impact on the fluvial ecosystem, impeding the reproductive migration of the populations of salmon *(Salmo salar)*, brown trout *(Salmo trutta)*, shad (Alosa alosa, Alosa fallax), eel *(Anguilla anguilla)* and lamprey *(Petromyzon marinus)*, and affecting the lifecycle of other fish and mollusc species. The dam is one of nearly 50 that were built in Galicia between 1950 and 1990, when environmental considerations were considered to be less important than other demands on water resources.

During the migration period, the adult migratory fish populations accumulate at the bottom of the dam and are unable to go further upstream to reach the upper area with suitable spawning conditions. As well as leading to considerable reductions in populations of fish species, the dams also had an indirect impact on birds and animals that were dependent on these for foods.

What did LIFE do?

This LIFE project aimed to address the negative environmental impact of the 33 metre-high Frieira dam by providing passage facilities to encourage upstream fish migration. It set out to:

- Increase the number of fish passing over the dam;
- Increase biomass in the upstream part of the dam (reservoir and river);
- Improve the whole fluvial ecosystem on the upstream side to the benefit of other animals and bird populations;
- Maximise the usage of spawning areas;
- Improve management of fish stocks and bring about an increase in fishing related economic activities.

Cable car used to lift the fish over the dam

Photo: Union Fenosa

The construction of adult fish passage facilities comprised three steps. A fish ladder was built in the lower part of the dam that allows water flow to be regulated according to volume and the demand for energy. This structure also allows fish to be captured in a "basket", ready to be then transported.

The second step entailed the construction of an elevator system to transport the fish, consisting of a cable-car system (250m long) that carries the fish in tanks from the capture pools to the restitution channel situated upstream of the dam. Finally, restitution channels were built (125 m long) in order to guide the fish from the elevator device to the reservoir.

What was the outcome?

In the course of its use and following damage caused by floods in 2002, modifications have been made to the system and it is now working very efficiently. Other long-term benefits of the project include the adoption of environmental principles at the other 17 hydraulic centres in Galicia owned by Union Fenosa. An environmental agreement *("Pacto Ambiental")*, which was reached between the company and the regional government shortly after the start of the project, is renewed on a yearly basis. The agreement implements Galician legislation that requires the commitment of private entities to implement specific actions of environmental improvement.

Photo: Audrey Thérad

Frieira hydroelectric dam on the River Minho

Project Number:
LIFE99 ENV/E/000347

Title: International restoring project for the Miño river…

Beneficiary:
Unión Fenosa SA, Spain

Contact: Francisco Bustio Gutierrez

Email:
fabustio@unionfenosa.es

Website:
http://www.unionfenosa.es/

Period:
20-Sep-1999 to 20-Jun-2002

Total Budget: € 1,088,000

LIFE Contribution: € 297,000

Monitoring the status of EU Rivers

The WFD requires an integrated monitoring programme to be established in each river basin district in order to monitor the "ecological and chemical status" of a river. This is based on 'biological elements' (plankton, macrophytes, macroinvertebrates and fish) and 'supporting elements' (chemical and hydromorphological) that provide data necessary to assess the ecological status of surface and groundwater bodies in each river basin district.

The LIFE programme is helping to provide the tools necessary for the development of methodologies that could be used in monitoring the status of the rivers. LIFE is also developing expertise to help establish operational standards and best practice management.

Belgium: Ecological quality assessment based on the fish populations of the Meuse

This LIFE project was the first international research initiative in Europe to focus on the standardisation and adaptation of a fish-based index for an entire European river basin in order to evaluate the ecological status of running waters.

The WFD requires that rivers attain good ecological status (or at least good ecological potential) by 2015. Assessment of this status or 'health' of aquatic ecosystems, involves examining their physical, chemical and biological characteristics. If the requirements of the WFD are to be met, effective monitoring tools are needed to measure the status of rivers at scales large enough to be useful for Europe. These tools need to be ecologically based, efficient, cost-effective, rapid and consistently applicable to different ecological regions.

The Meuse river basin, Belgium

For aquatic ecosystems, biological indicators can be chosen from a range of flora and fauna. The advantages of using fish are that 1) they are present in many water bodies, 2) their taxonomy, ecological requirements and lifespans are generally better known than for other aquatic species, 3) they occupy a variety of trophic levels and habitats, 4) they have both economic and aesthetic or amenity value, and thus help raise awareness about the necessity of conserving aquatic habitats, and 5) some of them are migratory or are dependant on long reaches or areas. These characteristics provide additional and complementary information to that already available from monitoring other organisms. However, there are relatively few suitable ecological tools based on fish populations available for the assessment of river conditions in Europe.

What did LIFE do?

With the aim of assessing the ecological quality of international rivers in line with the WFD, the project's beneficiary, the University of Namur (FUNDP, Belgium), and its partners (the French Conseil Supérieur de la pêche (CSP), the Flemish Instituut voor Bosbouw en Wildbeheer (IBW) for Flanders and the Nederlands Instituut voor Visserij Onderzoek (RIVO), developed two new fish-based indices.

The Trisection Method Index (TMI), the Belgian strategy for designing a fish based index, is based on the Index of Biotic Integrity (IBI). Ideally, environmental conditions at the site of concern are compared with the attributes expected in undisturbed streams or rivers of similar size and habitat type located in a similar geographic region. The Multivariate Model Index (MMI), based on a Fish-Based Index methodology previously developed for French rivers, uses statistical models to predict the site-specific fauna to be expected in the absence of major environmental stress. The aim was to predict the characteristics of fish populatons at a given site as a function of a set of variables reflecting natural conditions at different scales, from local to regional.

Both indices have been developed during the following four phases, which have been implemented in close collaboration between the countries concerned (France, Belgium and The Netherlands):

- Determination of potential zoning in the whole Meuse River basin through an analysis of historical and recent data. Testing and standardisation of sampling methodologies used by the different partners during their regional or national programmes, and definition of ecological guilds for autochthonous fish species.
- Determination of reference systems by prospecting sites without significant perturbations in the tributaries and the less altered sites in the main channel.
- Selection of IBI metrics (such as species' abundance, ecological needs etc.,) for tributaries and the main channel, and study of the influence of the potential zoning in the Meuse basin. For the main channel, special attention was paid to the identification of specific metrics based on the spatio-temporal variations of the fish populations. To this aim, population dynamics and relative abundance of the different populations in some target fish species were monitored since these are good indicators of quality in large rivers.
- Study of IBI spatio-temporal variation and comparison of its sensitivity to other physico-chemical and biological indicators.

What was the outcome?

TMI and MMI proved to be satisfactory methods for assessing the biotic integrity of streams and rivers in the Meuse basin. These indices were very efficient in discriminating over a range of anthropogenic perturbations. They were also consistent over time, flexible and widely adaptable.

The overall proportion of presumed errors of classification was roughly the same for both indices. The project showed a significant difference between the distribution of fish integrity classes and those obtained from indicators of water and habitat quality for TMI. This discrepancy was greater on the Flemish sites and with large rivers.

The project also showed no significant differences between the distribution of fish integrity classes and those obtained from indicators of water and habitat quality for MMI. The main deviations, while not statistically significant, relate to a tendency in underscoring small rivers.

The TMI is simple to design and is good at assessing anthropogenic impacts. It does not require many environmental parameters or initial selection of reference sites to be built. However, it also doesn't implicitly integrate all major environmental factors that cause, or at least explain, the patterns of assemblage composition and distribution within and among water bodies at various spatio-temporal scales under natural conditions. The index tended to underscore systematically the ecological quality of sites, particularly the Flemish and the large river sites.

The MMI seemed to be the more appropriate index for an application to the whole river Meuse basin. It also integrates the relevant environmental factors better than the TMI. Nevertheless, it becomes more complex and its application requires a preliminary selection of reference sites, a difficult and subjective task.

Pending validation in other European river basins, MMI should be recommended as more suitable for international contexts, while the TMI is best suited to a regional context.

Index of Biotic Integrity (IBI)

Originally developed in the United States for use in small, warm water streams (that is, those too warm to support salmonids), IBI is a multi-metric index based on the hypothesis that there are predictable relationships between fish population structures and the physical, chemical and biological conditions of stream systems. This index employs a series of metrics based on population structure that give reliable signals of river condition to calculate an index score at a site, which is then compared to the score expected at an unimpaired comparable site. Each metric reflects the quality of a different aspect of the fish population that responds in a different manner to aquatic ecosystem 'stressors'.

Project Number:
LIFE97 ENV/B/000419

Title:
A Biotic Index of Fish Integrity (IBIP) to evaluate the ecological quality of lotic ecosystems - application to the Meuse River basin

Beneficiary:
Facultés Universitaires N.D. de la Paix, France

Contact: J.C. Micha

Email:
delphine.goffaux@fundp.ac.be

Website: (beneficiary's)
http://www.ibw.vlaanderen.be

Period:
01-Dec-1997 to 30-Nov-2000

Total Budget: € 857,000

LIFE Contribution: € 427,000

The Netherlands: Implementing a common approach to river management in Northern Europe

Differences in the management of sediments in the rivers Meuse and Scheldt in the Netherlands, Belgium and France have held back the development and implementation of a common river basin approach to this issue. A LIFE project developed a methodology for monitoring and assessment of sediments in both rivers, with a view to broader application.

River Scheldt (left) and an illustration depicting sediment-sampling

The International Commissions for the Protection of the Meuse and the Scheldt (ICPM and ICPS) play an important role in drawing up international agreements for improving the quality of water and sediments in the catchments of the two rivers. Management of contaminated sediments, however, differs from country to country and hamper the implementation of a common river basin approach in line with the WFD.

ICPM and ICPS have drawn up a list of differences and similarities in the management of contaminated sediments to improve understanding between the countries and serve as a starting point for harmonising policy. Taking into account these national differences, this LIFE project aimed to develop a common method for monitoring and assessing contaminated sediments.

What did LIFE do?

The project was implemented by the RIZA (Institute for Inland Water Management and Waste Water Treatment), the research and advisory body of the Rijkswaterstaat (the Department for Public Works and Water Management) for inland waters in the Netherlands and AKWA (Advisory and Knowledge Centre on Sediments), a joint cooperation between several specialised institutes of the Rijkswaterstaat. Together with partners in the four regions (Flanders, Wallonia, France and The Netherlands), they created four areas of activity:

- Legal aspects and regulation of contaminated sediments.
- Methods for monitoring and assessment of contaminated sediments.
- Field testing of the common methodology.
- Destination of dredged contaminated sediments (treatment and reuse).

Assessment of contaminated sediments was advanced by the project through the optimisation of sampling and the determination of appropriate indicators. Such a move towards obtaining a common view of assessing contamination has prompted scientists from institutes in other regions of Western Europe to develop a similar approach. A common monitoring system and common standards can be used to define the objective of "good ecological status" in the WFD and to prepare an inventory of the status of sediments in different river basins.

The project also pointed the way towards long-term harmonisation of sampling, assessment criteria and dredging regulation, which differs in the regions of the project. The common method for the assessment of sediments is based on a dual approach, incorporating bio-assays and field assessment. A broad agreement has been reached on the parameters for physico-chemical analysis, and specialists agreed upon a proposal for both the ecotoxicological as the biological assessment method. More data, however, are still needed in order to come to definite conclusions and to establish reliable common standards.

Finally, the project developed a model for destinations of contaminated dredged sediments and a decision support system. The model includes information on the characterisation of sediments, possible destinations, dredging techniques, and transport and treatment technologies. Based on the physical/chemical properties of the dredged sediments, the most suitable treatment technique was subsequently determined.

Project Number:
LIFE99 ENV/NL/000263

Title: Development of a common method in quality assessment and approach of contaminated sediments

Beneficiary:
AKWA, RIZA, Rijkswaterstaat, the Netherlands

Contact: Daniel Clement

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Website: www.minvenw.nl/rws/projects/akwa/html/producten/index_producten.html

Period:
01-Nov-1999 to 01-Apr-2002

Total Budget: € 251,000

LIFE Contribution: € 251,000

Improving the status of European Rivers

Improving the ecological quality and function of rivers implies the implementation of river enhancement or restoration techniques as part of wider management strategies all aimed at achieving good status. The LIFE programme is contributing to the improvement of the status of rivers by co-financing river restoration and enhancement activities ranging from channel engineering, renewal of riparian vegetation, bank stabilisation and natural habitats improvement and conservation. LIFE also helped to found the European Centre for River Restoration – building capacity and establishing a Europe-wide network for the exchange of knowledge and best practices.

Denmark: Establishing a European Centre for River Restoration

In recognition of the need to improve means of sharing knowledge and experience of river management, a LIFE project was set up to develop a European Centre for River Restoration. The centre established a Europe-wide network for the exchange of knowledge and best practice.

River restoration is widely accepted as an effective way of alleviating both water quality and flooding problems. Restoration initiatives are seen as being part of the means to satisfy the WFD requirements to achieve good status in all surface- and ground waters by 2015.

While many projects have been undertaken in recent years in Europe, including those in Eastern Europe through the PHARE[1] and TACIS[2] programmes, the exchange of information and experiences between local authorities both on a national and an international level proved inadequate. In some countries (Denmark, Germany and the UK) national information centres have been established, but experiences and achievements cannot easily be exchanged on a European level.

1 Programme of Community aid to the countries of Central and Eastern Europe.
2 Technical Aid to the Commonwealth of Independent States.

What did LIFE do?

This LIFE project developed a European Centre for River Restoration to promote the restoration of rivers and riparian areas in Europe. The beneficiary was the Freshwater Department of the National Environmental Research Institute, Denmark, a research institution that forms part of the Danish Ministry of the Environment.

The Freshwater Department set up the European Centre for Restoration of Rivers (ECRR) to generate cost-efficient benefits for the protection of biodiversity, flood defence and water quality. It was charged with developing a European network of national institutions and river restoration organisations from as many European countries as possible.

European Centre for River Restoration logo

The ECRR brought together designated institutions from each EU Member State. Information on river restoration was distributed through newsletters, a website and scientific journals, and several online databases were established. Its main objectives were to:

- Encourage more river restoration;
- Achieve greater benefits from river restoration projects;
- Improve the cost-benefit ratio of river restoration works;
- Obtain greater biodiversity, and better water quality and flood management;
- Improve confidence in promoting and implementing river restoration;
- Bring about changes in policy and practice on river restoration to reflect the needs of the 21st Century - including having river restoration accepted as an integral part of sustainable water management;
- Improve European access to, and exchange of information from worldwide experience in river restoration.

What was the outcome?

The project established the centre and its network and databases, and organised an international conference. At the end of the project, the ECRR network consisted of 350 institutions and private individuals. In addition, national networks have also been established in the UK, Denmark, Romania, Russia, Italy, Spain and Norway. Further co-operation has also been established with several other organisations including the Netherlands Centre for River Studies, the European Centre for Nature Restoration, WWF, Ramsar, IUCN and EIONET. A guideline for establishing national networks was drawn up, and information about the ECRR activities and national and international activities on river restoration was made available on a new website. Databases on key institutions and contacts are also available online.

A five-day international conference "River restoration 2000- Practical approaches" was held in Wageningen, the Netherlands in May 2000. More than a hundred delegates from 24 European and four non-European countries attended. A conference report is available in a hard-copy version as well as a PDF version, which can be downloaded from the website below.

A follow-up study was conducted a year after the event to evaluate the extent of contacts established at the conference. A follow-up ex-post evaluation, carried out by the LIFE external monitoring team in May 2004, showed that the project has had a long-term impact and that the network is still operating and growing. The secretariat was taken over by RIZA (the Netherlands National Institute for Integrated Water Management and Wastewater Treatment), and then by its Italian counterpart. The ECRR, RIZA and Croatian Water hosted the 3rd International Conference on River Restoration – "River Restoration 2004:- Principles, processes & practices" held in May 2004 in Zagreb, Croatia.

ECRR activities

- Networking - putting people in touch with each other
- Reporting - newsletters, Internet
- Promoting good practice in the implementation of the WFD
- Creating a catalogue of case studies and a database (with decentralised maintenance)
- Devising a common glossary for river restoration
- Training and education - referral service and facilitate exchange
- Organising workshops, meetings and conferences
- Developing guidelines
- Developing standards for appraisal and monitoring
- Demonstrating projects and site visits
- Research and monitoring - referral service
- Reporting on the state of the environment
- Transfering knowledge
- Finding compatible solutions for flood defence and ecological restoration

Restoration project on the River Dinkel, the Netherlands (left), an ECRR river tour, 2002 (right)

Project Number:
LIFE99 ENV/DK/000619

Title:
European Centre for River Restoration

Beneficiary:
National Environmental Research Institute (NERI), Denmark

Contact: Ulrik Lorenzen

Email:
oxboel@sns.dk

Website: www.ecrr.org/

Period:
01-Apr-1999 to 01-Apr-2002

Total Budget: € 270,000

LIFE Contribution: € 134,000

Germany / Austria: Restoring the River Inn's hydrological dynamics and floodplain habitats

More than five years after official closure, the achievements of this Austrian-German LIFE-Nature project are still visible. It targeted the restoration of the hydrological dynamics along the Lower Inn floodplain, the conservation of its fauna and flora and the maintenance of the area's considerable ornithological value.

The Inn valley straddling the German-Austrian border is one of the most important areas for wildfowl and waders in Central Europe. The birds are attracted to four artificial lakes, which were created in the 1950s when hydro dams were constructed across the River Inn. Thanks to the river's strategic location at the foot of the Alps, and under the influence of the Inn's river dynamics, these lakes are now a haven for more than 120,000 water birds annually, with some 285 bird species recorded since the 1960s. This birds' paradise (recognised under the Ramsar Convention[1]) is also surrounded by alluvial forests dominated by alders *(Alnus glutinosa)* and willows *(Salix spp.)* and oak-elm-ash communities.

The River Inn, straddling the German-Austrian border

By the late 1990s there was a growing awareness that the high quantities of natural silt brought down by the River Inn from the Alps were putting this area at risk in the longer term. These fine sediments were causing an accelerated 'terrestrialisation' of the site's habitats (i.e transforming the wetlands habitats into dryer habitats) threatening its attraction to birds both as a staging point and as an over-wintering site for waders and waterfowl.

1 Convention on Wetlands of International Importance especially as Waterfowl Habitat, 2 February 1971. UN Treaty Series No. 14583.

Common Sandpiper
(Actitis hypoleucos)

What did LIFE do?

Together with the Upper Austrian Government the Bavarian Environment Ministry applied for funding for this first German-Austrian trans-boundary LIFE project. Its main objectives were to restore the river's sediment transport dynamics, as well as to preserve the terrestrial habitats of the floodplain. The project area covered 3,200 ha, including a 46 km reach of the river Inn, as well as the riparian woodlands on the Bavarian side.

River Inn embankment opening – before the project work (top) and after (below)

The project aimed to prevent the Inn's habitat types from becoming progressively choked with sediment. This would be achieved by restoring the hydrological dynamics of the river/floodplain, more specifically by restoring the erosion, sediment transport, and sedimentation processes in the area. To this aim, the Austrian partner opened up 100 metres of the river dyke to allow the water to drain into the Hagenauer Bucht, a 2 km^2 wetland area. This 'river enhancement' action was based on detailed flow models, which enabled the preparation of the works and an assessment of potential risks, including the possible erosion of the flood dykes. The hydrological models recommended the opening of the dyke, determined the optimal size and location of the opening, and provided a scientific basis that could potentially be applied to other areas of the Inn floodplain.

In order to restore or enhance the terrestrial habitats of the floodplain and to facilitate nature conservation management actions, the project also purchased 108 ha of alluvial forests. This action included:

- The management of 73 ha of alluvial oak-elm-ash forests or grey alder forests, where 10.2 ha of non-native trees were removed;
- The reinstatement of traditional coppicing management of grey alders on 1.7 ha;
- The conversion of 22 ha of arable land to grey alder forest, and the testing of various techniques to speed up alder growth;
- The recreation of a mosaic of habitats consisting of hay meadows, ponds, sedge wetlands, dunes and gravel flats. The most important example was realised behind the flood dyke near the village of Eglsee, where 7 ha of formerly arable land were recreated in this mosaic of habitats, which had almost disappeared over the last century.

In order to reconnect two sections of a cut-off river meander at the "Aufhausener Au", a channel was dug across purchased land. In the same area, six new pools for amphibians were excavated, three of which are adequate for the Great crested newt *(Triturus cristatus*) and the yellow-bellied toad *(Bombina variegate);* both Annex-II species.

Restoration of dry species-rich grassland patches within the floodplain forests

The project also tackled the restoration of so-called 'Brennen' sites (dry species-rich grassland patches within the floodplain forests) by cutting overgrowth. The total area of the Brennen grassland habitats increased from 0.5 ha to more than 5 ha. Rudi Tändler, in charge of on-site project implementation at the Landkreis Rottal-Inn, commented: "The necessary Brennen restoration would not have been possible without LIFE funding". LIFE-Project Manager, Dr. Willy Zahlheimer, added: "The project actions were realised just in time. Within a few more years the remains of the Brennen would have totally disappeared and their flora and fauna would have been further degraded."

Sheep grazing was reinstated along 10 km of dyke. This proved a cost-effective ecological measure to maintain the flower-rich dyke grasslands in the longer term.

The project hired local farmers and forestry workers to do much of the work. This helped to increase the local acceptance and support of the project, as following the project's closure, some locals continue to be employed in 'After-LIFE' maintenance work.

Birds benefiting from the LIFE project actions – black-winged stilt (Himantopus himantopus) *(left) bittern* (Botaurus stellaris) *(right), reed warbler* (Acrocephalus scirpaceus) *(below left)*

What was the outcome?

The project actions had a direct benefit on habitats, species and birds of the Habitats and Birds Directives. The project managed to create 21.9 ha of alluvial forest and new aquatic habitats on the floodplain suitable for amphibians and wildfowl and waders. Moreover, the restoration of the river hydrodynamics had a positive impact on the shallow water and sand habitats, thus increasing local biodiversity.

"It was great to learn that local and trans-boundary conflicts of interest can be solved satisfactorily due to EU funding and within a concrete, time-restricted project." said Dr. Zahlheimer. "LIFE also contributed to a good relationship between local authorities, hunters and anglers as well as the general public, which still exists five years after the project's closure." added Christine Kotz of the Landratsamt Passau, a project partner.

This close cooperation with all concerned parties and with the local electricity companies, who were project partners, helped guarantee the project's success and made it possible to combine resources and expertise from both sides of the Inn. Collaboration with another EU programme – the Interreg II project 'AENUS', which targeted a trans-boundary, integrated zoning concept for tourism and the local economy, contributed to the integrated approach taken by the LIFE team.

A good deal of media/public relations work was also undertaken by

LIFE project information panel

Alluvial forest on the margins of the lower Inn

the project. This resulted in the publication of a number of press articles, information sheets, two brochures and a LIFE project calendar. Public meetings were held in the villages and an exhibition toured schools and municipalities. A seminar was held in October 2001, on restoring floodplain dynamics, and the project participated at the Green Week in Brussels as well as at the 'Nature Conservation Day' of the Bavarian Parliament. In addition, two visitor platforms and five information panels were erected in order to guide and channel visitors. The Info Centre Ering still offers monthly tours in the LIFE area. For March 2007, a special 'Naturerlebnispfad' is planned by the Landkreis Rottall Inn, one of the project's areas.

Green toad (Bufo viridis) *Annex IV of the Habitats Directive*

Life After LIFE

Since the work undertaken to restore or enhance the River Inn's hydrodynamics was new and innovative, and the long-term conservation benefits were not quantified, the Upper Austrian Government financed a five-year monitoring programme after LIFE. Although the final results will not be available until the end of 2007, mid-term results are already encouraging. Bird songs monitored over the years at five different points showed a promising increase in bird species (in 2000, 25 out of 52 bird species chosen for observation have been counted, in 2006 the figure rose to 42). Josef Eisner, the Austrian project manager, says: "While the positive results with regard to the bird populations have been expected, the fish-results were quite surprising." According to Eisner there seem to be more and bigger fish species than expected. He is confident that this trend will continue.

Dr. Zahlheimer concluded: "The results already achieved, together with the ongoing commitment of the former project-team, underline that the Lower Inn LIFE project was indeed a success-story."

Project Number:
LIFE98 NAT/D/005372

Title: Lower Inn with riparian woodland

Beneficiary:
Bayrisches Staatsministerium für Landesentwicklung und Umweltfragen

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Website: http://www.web.rottal-inn.de/sg_55/life-projekt/life_natur_index.htm

Period:
01-Jul-1998 to 31-Mar-2002

Total Budget: € 3,823,000

LIFE Contribution: € 1,911,000

Austria: Aiding migration of endangered fish in the Danube

The huchen, a species of salmon, and other endangered fish in the river Danube have in recent years suffered difficulties in migration. An ambitious LIFE project aimed to boost populations by building migration aids and improving spawning habitats. The project's successful strategy has been adopted by a number of other LIFE projects aiding in particular, two follow-up initiatives further upstream and downstream.

Photo: Freiwasser

Danube salmon (Hucho hucho)

The huchen or Danube salmon *(Hucho hucho)* is found only in the Danube and its tributaries and is the largest central European salmonid. It has all but disappeared in Bavaria, and the remaining huchen stocks in the four Austrian Danube tributaries – Mur, Pielach, Drau and Gail – are the largest in the EU.

While populations have long been affected by pollution and overfishing, more recent negative influences result from the creation of dams and other obstacles to migration. These barriers also prevent exchange between subpopulations. Moreover, watercourse regulation has led to the loss of important spawning and feeding grounds.

The lower Austrian regional authority, together with the nature protection authority and the water authority, worked towards overcoming some of these barriers as part of the LIFE project. The project area consisted of the middle and lower stretches of the rivers Pielach, Melk and Mank in Lower Austria. While some stretches of the Pielach are still in their natural/semi-natural state, the Melk has been altered considerably by regulation and the introduction of canals.

What did LIFE do?

The aim was to improve the possibility of migration for the huchen, and other endangered river fish such as Freshwater Nase (*Chondrostoma nasus)* and Barbel (*Barbus barbus)*, over a total length of 78 km by opening up the rivers Pielach, Melk and Mank and linking them with the free-flowing stretch of the Danube in the Wachau region. The project would alter weirs and other obstacles to permit the passage of fish. In addition, buffer strips along the banks where the river meanders would be created to aid the development of suitable spawning grounds.

Central to the success of the project was the involvement of local landowners, holders of rights to use water and licensed anglers. Other partners included the town of Loosdorf, the Austrian Friends of Nature, WWF and the Federal Environment Ministry.

What was the outcome?

At the end of the project, 11 obstacles to fish migration had been adapted through the construction of fish by-passes. As a result, Danube fish are again able to enter the rivers Melk and Pielach during their spawning migrations. Monitoring carried out as part of the project by the University of Natural Resources and Applied Life Sciences of Vienna confirmed this result. A fish inventory for 68 ha of riverbed was mapped out.

The project also purchased 75 ha of alluvial land and buffer strips for habitat restoration. As well as creating spawning grounds, river bed enlargement and the planting of alluvial forests on this land will ensure that the river continues to pursue a natural course in the future.

LIFE project work – top (left to right): opening a new side channel that allows for the migration for fish at the weir 'Eibelsau' – weir, and construction of the side channel – below (left to right) first water flowing into the new channel, and channel with flowing water and vegetation allowing the fish to migrate upstream

Along 2.6 km of regulated river sections at Mank and Melk, a free-flowing stream with many different types of river habitats was restored. This has had a positive impact on fish spawning and *Chondrostoma nasus* was observed for the first time in 2004 in the Mank river section. Otters were also spotted using this restored section for feeding and hunting. On the Melk section, kingfisher, little ringed plover and goosander started to breed again.

This LIFE project was the first of its kind in Austria, to ambitiously target the elimination of fish migration obstacles along a large-scale river section. A key output was that a number of later LIFE projects followed this strategy (e.g. Donau-Ybbs, Wachau, Lafnitz, Obere Mur, Lech). Specifically, the LIFE projects Wachau (LIFE03 NAT/A/000009) and Donau-Ybbs (LIFE04 NAT/A/000006) are logical continuations of this project, enlarging sections of the Danube course further upstream and downstream.

Restoring the migration route for fish at the 'Weißer Stein' weir

Project Number:
LIFE99 NAT/A/006054

Title: Living space of Danube salmon

Beneficiary:
Region of Lower Austria (Land Niederösterreich), Austria

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Period:
01-Jul-1999 to 30-Jun-2004

Total Budget: € 3,561,000

LIFE Contribution: € 1,780,000

Reconnecting rivers and floodplains

Some European rivers are heavily modified and characterised by channels with disaggregated floodplains and altered water-level periods. As a consequence, former extensive aquatic/terrestrial flood transition zones lack most of their past hydrological functions such as flood prevention, protection and regulation, as well as their ecological functions.

Along the large rivers of Europe, various LIFE floodplain restoration and rehabilitation projects have been realised in recent years, albeit at demonstration scale. These actions involve the restoration of semi-aquatic components of floodplains, the rehabilitation of secondary channels, reconnecting disconnected and temporary waters (ox-bow lakes) as well as other wetlands. There are also LIFE funded projects that establish flood-alert systems and flood mapping risk assessment. LIFE projects have found solutions which are acceptable to local stakeholders.

Belgium: Flood management and ecological restoration in the Dijle valley

A cost-effective and environmentally attractive alternative to dam construction to prevent flooding of the river Dijle in Leuven, Belgium, was made possible with the aid of LIFE-Nature co-funding. Natuurpunt, a Flemish conservation NGO that owns an area of land to the south of the city, was able to implement a management plan for the river valley over an area 4km long by 1km wide.

LIFE funding enabled Natuurpunt to acquire sufficient land and remove obstacles to flooding, such as poplars and maize crops, to demonstrate that creating a 'natural' river that overflows into floodplains can alleviate flooding further downstream. Before the introduction of the river management plan of the river Dijle, flooding would regularly affect areas of Leuven including the famous University campus.

Organisers of the plan say that the city hasn't experienced flooding for several years following the start of the project. While it was difficult to convince the regional authorities of the effectiveness of the plan – there was some initial local resistance – it has been shown to be successful. River managers from other countries, such as France (Lille) and Germany (Koblenz), as well as other regions in Belgium, have visited the site with a view to implementing similar plans for their rivers.

What did LIFE do?

Improved flood alleviation is not the only benefit of the project. The project area is extremely species rich and its grassland habitats are protected by

A 4 km stretch of the River Dijle has been made more 'natural'

the Birds and Habitats Directives. Agricultural activity including crop farming and the plantation of poplar trees for wood pulp, however, has altered the land in recent years. Given the changes in the water level management regime of the area resulting from the project, and arguably for other reasons, it is no longer profitable to cultivate poplar plantations. Consequently, the project made provision to compensate some farmers. In many areas land bought by the beneficiary, Natuurpunt, is now leased back to farmers for grazing, free of charge. It was necessary to destroy weekend cottages in the creation of the new floodplains.

The project aimed to create a more 'natural' river, by allowing it to follow a natural course, and build up sediments on the banks and allowing erosion to occur. In this way, the river is beginning to change its course as the process of meandering takes place. Piet De Becker, an eco-hydrologist at the Institute for Nature and Forest Research says that the size of the floodplain is essential to the success of the plan. "If the floodplain is too small, then the silt-rich floodwater will create too much mud and destroy vegetation. So it was important for us to create a large floodplain that would allow for a richer environment," he says.

What was the outcome?

The 500 ha of land managed by Natuurpunt at Doode Bemde, which the Dijle passes through, has been an established nature reserve for many years. Several ponds, which were created in the 1940s and 1950s for the cultivation of carp, are home to many migratory birds in spring time and the restoration of the floodplain ecosystem is attracting many more. The Dijlevallei LIFE project constructed two wooden viewing huts for keen bird watchers, and for more casual amenity use, a raised wooden path was also built. Riverine mammals are expected to benefit from the improved habitat,

Allowing the river to regularly flood upstream can prevent flood damage further down

in particular beavers that were previously reintroduced to the area.

The organisers of the LIFE project recognise that while it was important to first convince the authorities that the management plan would help alleviate flooding in Leuven, they say that its conservation benefits mean that it is a "win-win situation". Says De Becker: "It is also a cheaper solution than constructing a large dam near the city even if you have to buy a large amount of land."

Natuurpunt's target areas of land for purchase targets, however, changed markedly during the project, as the government authorities began acquiring land originally earmarked for purchase by the beneficiary. As part of the LIFE project, Natuurpunt bought 54.3 ha of land that was mostly former grasslands planted with poplars or overgrown as a result of abandonment, as well as fish ponds and patches of degraded woodland. An additional 44.8 ha, acquired by AMINAL-Natuur and AMINAL-Water, and 10 ha, acquired by VLM (agri-structural authority), was leased to Natuurpunt to manage. Before the LIFE project Natuurpunt managed 99 ha (20% of the project area), but this amount has now increased to 208 ha (42% of the project area), and consists mainly of large coherent blocks.

The ecological benefits of the project, however, are dependent on the quality of the river water. River water quality in Belgium is assessed using a biotic index, and the Dijle was given the lowest possible ranking when the idea of the flood-management plan was first considered. The river flows through several industrial towns in Wallonia before arriving in the Leuven area. With such poor water quality, the project would not have been viable and Natuurpunt campaigned for a reduction in pollution. The biotic index for the Dijle has steadily improved and is now six out of a possible score of 10.

Generations of local schoolchildren have visited the reserve at Doode Bemde, but De Becker says that there is a growing awareness of ecological issues that initiatives such as the LIFE project are helping to strengthen. Around 1,800 people attended an open day held at the start of the project, and information boards around the site inform visitors about the conservation work.

The Dijlevallei project continues to be influential and has collaborated with a research project undertaken by the University of Cardiff on the role of LIFE in Natura 2000 sites.

Summary of activities

A summary of the main activities of the project (that were carried out by four hired staff members and a local employment initiative for disadvantaged youth and volunteers):

- 43 ha of poplars were removed, including the total removal of stumps on 18 ha.
- Four weekend cottages were demolished.
- A 4 ha maize field was converted to extensively managed grassland.
- 7.6 ha of grassland was restored to Annex I habitat status by appropriate recurrent mowing and grazing.
- Shrubby overgrowth was removed to restore 3.4 ha of former habitats of the Desmoulin's whorl snail *(Vertigo moulinsiana)*.
- 4 km fences were installed to improve grazing management: 10 ha of the Doode Bemde is now managed by grazing and 40 ha by hay mowing followed by grazing.
- The banks of the 24 ha Langerode pond were cleared of trees and bushes and regraded in order to stimulate reed growth. A small pond was restored in order to act as an amphibian habitat and as a nature education site.
- 5 ha of degraded woods and poplars were ring-barked to provide standing dead wood.
- A 400 m stretch of a ditch that drains the Langerode wood was filled in.

View from an observational hut constructed by LIFE for viewing migratory birds

Project Number:
LIFE98 NAT/B/005171

Title: Dijlevallei

Beneficiary:
Natuurpunt Beheer, Belgium

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Website: www.natuurpunt.be

Period:
01-Sep-1998 to 01-Sep-2001

Total Budget: € 845,000

LIFE Contribution: € 412,000

Denmark: restoration of habitats and wildlife of the River Skjern

The River Skjern in western Jutland is the largest river in Denmark in terms of water flow and has a catchment area of 250,000 hectares. At the mouth of the river, there was once a huge expanse of marshland (4,000 ha) harbouring a mixture of wetland habitats: meadows; reed-swamps; meandering watercourses; fens and shallow lakes. This floodplain was a haven for wildlife.

The restored valley with meadows and lakes

In addition to the thousands of migrating birds who used it as a stop over point along the Western Palaearctic flyway, there were also stable breeding populations of bittern *(Botaurus stellaris)*, black tern *(Chlidonias niger)* and corncrake *(Crex crex)*. Other species such as the otter *(Lutra lutra)* and Atlantic salmon *(Salmo salar)* were also relatively common.

Reconstruction work on the River Skjern

But these habitats were virtually destroyed following a relentless campaign of land reclamation, river canalisation and drainage in the 1960s. Initially, arable crops were fairly successful, providing some income from the newly created fields. As time went by however, these revenues began to diminish rapidly despite the large quantities of fertiliser used and because of soil collapse of arable land.

In 1987, the Danish government decided to launch a major strategy for marginal lands, for example farmlands of poor quality and high maintenance requirements in areas that used to be of high conservation value. The intention was to restore these to their former natural state and to introduce more compatible land use such as extensive grazing or recreational activities. The River Skjern was to be the showpiece of this strategy.

What did LIFE do?

The objective of this ambitious LIFE project – implemented by the project beneficiary, Denmark's National Forest

and Nature Agency – was to restore 875 ha of the river valley and to improve the biological diversity of over 1,600 ha by re-introducing grazing. To rectify poor physical conditions in the river-bed and its tributaries (due to channelling), heavy-duty construction work was undertaken to re-meander the river along a more natural course over a stretch of 20 km. As a result, when the river runs high it is able to break its banks and flood the meadows. This enables the content of nutrients, mostly from agriculture and fish farming, to be deposited and assimilated by the plants of the meadow and benefits both habitats and species. Once this physical work was completed, appropriate management measures were devised and introduced to encourage the return of the wide array of birds and other animals that formerly used the area.

The main targets were to:

- Improve the living conditions for bird species listed in Annex I of the Birds Directive, including: ruff *(Philomachus pugnax)*; sandwich tern *(Sterna sandvicensis)*; black tern *(Chlidonias niger)*; common tern *(Sterna hirundo)*; marsh harrier *(Circus aeruginosus)*; kingfisher *(Alcedo atthis)*; and spotted crake *(Porzana porzana)*;
- Create possibilities for priority bird species, corncrake and great bittern to re-establish breeding in the area;
- Improve the conditions for migrating birds in the Palearctic flyway, in particular Pink-footed goose (*Anser brachyrhynchus)*;
- Improve the conditions for the Annex I habitats and the Annex II species, as well as for a number of animal species in Annex IV of the Habitats Directive;
- Improve the spawning grounds and the possibilities for migration of the wild Atlantic salmon *(Salmo salar)*.

What was the outcome?

The main project objectives regarding the restoration of wetland habitats were reached and the expected nature conservation benefits were met. The re-meandering of 20 km of the river along a more natural course in the eastern part of the project site was successfully carried out. By the end of project, about 1,200 ha of grassland were established, which was less than originally foreseen (1,600 ha). The reason is that the restoration work finally resulted in increased areas of floodplain. However, these extended wetland areas have benefited important species such as the spotted crake, avocet and bittern and consequently will lead to more enhanced nature conservation. The targets set up at the start of project for the site to qualify for SPA status were also met. The official designation took almost two years and was finally completed in August 2006.

Overall, most of the expected environmental and nature conservation objectives were met during the project, except for the expected result concerning nutrient retention, which was still only around 10% at the end of the project. With regards to floods, the project took care to ensure its actions did not add to the risk of flooding outside the project area, which might have negative effects on the drainage of surrounding farmland. The monitoring results indicated a water-level increase inside the area but no negative impact to upstream neighbours. A management plan for the long-term sustainability of the site, over the period 2005-2020, was also drawn up.

Aerial view showing the former straightened river section (right) and the re-meandered section during the construction period (left)

Project Number:
LIFE00 NAT/DK/7116

Title:
Restoration of habitats and wildlife of the Skjern River

Beneficiary:
The National Forest and Nature Agency, Denmark

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Website:
www.SkjernEnge.dk

Period:
01-Jan-2001 to 31-Dec-2004

Total Budget: € 7,357,000

LIFE Contribution: € 2,207,000

France: Integrated development and management of the Saône Valley

On the basis of the Saône Valley Management Plan – the first such plan to have been drawn up for a French river – this LIFE-Nature project aimed to solve the valley's flood-related problems and restore its natural heritage in an integrated and sustainable way.

The River Saône, 482 km long, is characterised by major and frequent floods that concern more than 220 communities and 72,500 ha of flood-prone land. Since the 1850s the Saône Valley has been subject to significant embankment and river management programmes. The most recent of these is the Saône Valley Management Plan, drawn up in 1996 and adopted in 1997, which consists of 104 measures and recommendations with more than 1,000 local actions tailored to the specific features of the valley.

This action plan was the result of numerous studies carried out by the Syndicat Mixte Saône and Doubs, the LIFE project's beneficiary, a development association which groups together three regions, eight departments and six cities with more than 25,000 inhabitants. Its central idea was that the prevention of floods, the protection of inhabited zones and business parks against major floods and the development of tourist, agricultural and economic activities must take into account the conservation of drinkable water resources and ecological heritage.

What did LIFE do?

The LIFE-Environment project began in 1997 to implement the management plan, enabling the various steps to be planned and co-ordinated throughout the Saône Valley, as well as the setting-up of the long-term process to apply the agreed management and development measures.

The results include:

- Improved navigation work management. For the automation of the management of five Saône navigation dams, a mathematical algorithm was devised enabling the plotting of different water levels. Instructions could then be communicated to operate the valves from the upstream water level. This ensures better compatibility between navigational and agricultural interests during periods of minor flooding, and maintains flooding in sectors that will benefit from it environmentally.
- Restoration of the floodland. Several different sub-projects, aimed at the restoration of a meander in the High Saône, a marshland in the Rhone department and an irrigation canal, supplied information about the state of the current functioning of the flood land. Recommendations for restoration works and management decisions were developed in a floodland maintenance guide.
- Design and setting up an online environment service network *(http://www.observatoire-saone.fr/)*. A list of indicators describing the state of the valley, factors putting pressure on the environment and environmental impacts was established. This software enables the transfer of information to administrators, users and waterside populations and serves as a management and decision-making tool for the sustainable development policy of the valley.

The sub-projects implemented were in line with the management plan's recommendations and constraints (agricultural, hydraulic and environmental). The lessons drawn from the LIFE project can be used as a model for future valley management plans, such as for the Doubs, the Ognon and the Loue.

Photo: Mickaëlle Rousseleau

Restoration work was carried out on the flood area

Project Number:
LIFE97 ENV/F/000194

Title:
Integrated development and management of the Saône Valley

Beneficiary:
Syndicat Mixte d'Etude pour l'Aménagement du Bassin de la Saône et du Doubs

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Period:
01-Oct-1997 to 31-Dec-2001

Total Budget: € 1,087,000

LIFE Contribution: € 522,000

Stakeholder participation

Since 1992, that is well ahead of the adoption of the WFD, LIFE projects have been promoting mechanisms for active participation in planning and decision-making for the implementation of successful river restoration actions. On the following pages we highlight a successful trans-national partnership lead by the UK's RSPB, Europe's largest wildlife conservation charity.

However, there are many more examples of LIFE projects aiding long-term sustainable development with consensus from river communities including the Ythan project on page 25. For other Natura 2000 best practice examples, see the LIFE Focus publication, "LIFE-Nature: communicating with stakeholders and the general public", which is available for download from the LIFE website: http://ec.europa.eu/environment/life/infoproducts/naturecommunicating_lowres_en.pdf

UK: wise use of floodplains – a trans-national partnership

This participatory project was led by the United Kingdom's Royal Society for the Protection of Birds (RSPB), Europe's largest wildlife conservation charity. The RSPB brought together 14 partners from France, Ireland and the UK to provide comparative analysis of the wetland management methods used in different catchment areas.

In the past, river management in Europe has drained floodplain wetlands and isolated rivers from their floodplains. Problems such as flooding, water shortages and over-enrichment of water have been made worse in some areas by this approach. Modern thinking is that rivers cannot be managed in isolation from their floodplains, and rivers and their floodplains cannot be managed without balancing the demands put upon them by agriculture, industry, nature conservation and other interests.

A floodplain site in Somerset in South West England

The WFD aims to solve these problems by introducing integrated river basin management and requires EU Member States to meet new ecologically based objectives on the quality of water. The sustainable management of floodplains, a crucial part of the water cycle, is fundamental in meeting these objectives. Member States face problems in implementing the Directive, partly because they lack experience of the practicalities of gaining the active participation of stakeholders in decision-making at a catchment scale in an operational, as opposed to a political, context. The difficulties could be compounded because the value of wetlands is not

well understood by a wide range of stakeholders

What did LIFE do?

The project included an international comparison of participative methods used in different types of catchment areas for the management of wetlands. Tools were tested, produced and disseminated. It was designed to help Member States implement the WFD by demonstrating the value of floodplains and how their associated wetlands can contribute to the sustainable management of water resources within river basins.

It was implemented by a trans-national partnership, involving the UK's RSPB, together with 13 other partners in six project areas in the UK and France. The project highlighted the importance of organisations and communities working together to create a holistic and sustainable approach to the management of water resources.

What was the outcome?

This was a successful participatory project. The vast array of stakeholders involved at different levels in the management of wetlands led to the development of a range of tools to aid floodplain managers to implement the WFD with implications on a Europe-wide basis.

Youngsters explore the project's participative methods

These tools included:

- The establishment of an international communication network between project stakeholders;
- An action plan for each area to promote options for floodplain wetland restoration;
- A series of national and European workshops, looking at changes needed in policy and practice. These were published in a report on "Opportunities and Barriers to Sustainable Management of Water";
- The creation of a website and the promotion of the findings of the project;
- The presentation of key recommendations for European policy and funding changes needed to implement the WFD at national and EU level.

Life after LIFE

A post-project follow-up study of the project was carried out in June 2005 by the LIFE external monitoring team. It showed that the environmental benefits of the scheme arose from its use in advocating the more sustainable use and restoration of floodplain habitats, which are of vital importance to wetland wildlife.

The project's recommendations for floodplain management have been fed into guidance notes to aid the implementation of the WFD, and have formed the basis of lobbying in a variety of related policy areas. According to the beneficiary, teams running floodplain catchment projects throughout Europe are using the results of this project to shape their initiatives, and work is being undertaken within the catchments targeted by the project to turn the project recommendations into reality.

Among the many projects related to stakeholder dialogue that are currently using the outputs of the project are the UK 'Invest to Save' partnership of Government agencies and NGOs project, which is seeking dialogue with communities to secure the future sustainable management of coastal habitats; and the 'Ribble Pilot Project' on public participation. Says the beneficiary: "The principles and lessons learnt have informed proposals by Defra (the Department for Environment, Food and Rural Affairs), in relation to flood-risk management, and the Environment Agency, in relation to River Basin Planning, to roll out public participation programmes across England."

The Fens in Eastern England: a project site

Finally, the beneficiary says the methodology for a component of the UNDP/GEF Danube Regional Project with special reference to wetland and floodplain management was "directly influenced (even inspired)" by the LIFE project.

Project Number:
LIFE99 ENV/UK/000203

Title: Wise use of floodplains - a demonstration of techniques to evaluate and plan floodplain restoration

Beneficiary:
The Royal Society for the Protection of Birds, UK

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Period:
01-Apr-1999 to 01-Apr-2002

Total Budget: € 2,108,000

LIFE Contribution: € 1,052,000

Further projects focusing on rivers

The table below provides further examples of LIFE projects focusing on rivers. For more information on individual projects, visit the online database at: http://ec.europa.eu/environment/life/project/Projects/index.cfm The database provides useful, detailed search fields – for example under "keyword" (alphabetical or thematic) users may search under "river", "river management", "hydrographic basin", "international river basin" etc.

Start	Country	Number	Title
1998	Austria	LIFE98 NAT/A/005420	Region Wildernessriver Lafnitz
1999	Austria	LIFE99 NAT/A/006055	Combine of the flood plain-forests of the Upper Drau-river valley (Kärnten)
2000	Austria	LIFE00 NAT/A/007053	Wild river landscape of the Tyrolean Lech
2002	Austria	LIFE02 ENV/A/000282	Living River Liesing - Demonstrative Ecological Reconstruction of a Heavily Modified Waterbody in an Urban
2004	Austria	LIFE04 NAT/AT/000001	Lafnitz - habitat cross-linking on an Alpine pannonical river
2004	Austria	LIFE04 NAT/AT/000006	Donau- Ybbs Linkage
2005	Austria	LIFE05 NAT/A/000078	Conservation strategies for woodlands and rivers in the Gesäuse Mountains
2006	Austria	LIFE06 NAT/A/000127	Life in Upper Drau River
2002	Belgium	LIFE02 NAT/B/008590	Pearlmussels (in Belgium)
2005	Belgium	LIFE05 NAT/B/000085	Restoration of European otter habitats (Be & Lu)
2005	Belgium	LIFE05 NAT/B/000091	Transboundary habitat restoration in the valley of the Dommel
2004	Croatia	LIFE04 TCY/CRO/000030	Establishing institutional capacities for protection of river Mura landscape
1999	Cyprus	LIFE99 TCY/CY/000111	The River Valleys Project, Cyprus
2006	Czech Republic	LIFE06 NAT/CZ/000121	Preservation of alluvial forest habitats in the Morávka river Basin
2004	Denmark	LIFE04 NAT/DK/000022	Regional Actions to Improve Nature in River Odense and Odense Fjord
2005	Denmark	LIFE05 ENV/DK/000145	Odense Pilot River Basin - Agricultural Programme of Measures
2005	Denmark	LIFE05 NAT/DK/000153	Urgent actions for the endangered Houting *"Coregonus oxyrhunchus"*
1998	Finland	LIFE98 ENV/FIN/000573	A cost-effective decision support system for management of boreal river basins
1998	Finland	LIFE98 ENV/FIN/000579	Environmental protection in agriculture and local Agenda 21 applied to the river Vantaa Area
2000	Finland	LIFE00 ENV/FIN/000668	Integrated river basin management - a network for optimized water management, rehabilitation and protection of aquatic ecosystems in Karjaanjoki area
1997	France	LIFE97 ENV/F/000205	Analyses and comparison of assessment methods related to industrial pollution of water in the countries forming the Meuse watershed: Belgium, France, Germany and the Netherlands
1998	France	LIFE98 ENV/F/000299	Contribution of the alluvial woodland to the integrated management of the Tarn river
1999	France	LIFE99 ENV/F/000457	Efficiency of applied policies regarding prevention and control of diffuse and dispersed pollution in surface waters: inventory and comparison of approaches in Germany, Belgium, France, Netherlands, United Kingdom and Sweden.
1999	France	LIFE99 ENV/F/000492	Multi-parameters surveillance and protection of water quality
1999	France	LIFE99 ENV/F/000497	Local vegetation benefiting the restoration of every day nature
2004	France	LIFE04 NAT/FR/000082	Headwater streams and faunistic Heritage associated
2004	France	LIFE04 NAT/FR/000083	Programme for the conservation of the Rhône-Apron *(Zingel asper)* and its habitats
2006	France	LIFE06 ENV/F/000158	Improved management of nitrate pollution in water using isotopic monitoring
1994	Germany	LIFE94 NAT/D/000029	Restoration of the alluvial biotopes along the Elbe in Brandenburg
1996	Germany	LIFE96 NAT/D/003040	Stabilization of the population of beaver and otter
1998	Germany	LIFE98 NAT/D/005064	Rhön Biotope region - Building Block for Natura 2000
1999	Germany	LIFE99 NAT/D/005931	Ems flood plain : uninterrupted passage for fauna, lengthening of the course of the river, dynamic flood plain processes
1999	Germany	LIFE99 NAT/D/005936	Regeneration of the "Rambower Moor" for protecting bittern *(Botaurus stellaris)*
1999	Germany	LIFE99 NAT/D/005938	Restoration of the river country Sude-Schaale

Start	Country	Number	Title
2003	Germany	LIFE03 NAT/D/000003	Restoration of the habitat type "oligotropic low mountain stream"
2003	Germany	LIFE03 NAT/D/000006	River dynamics of the Ems River being close to nature location: Lower Saxony
2004	Germany	LIFE04 NAT/DE/000025	Living Rhine floodplain near Karlsruhe
2005	Germany	LIFE05 NAT/D/000057	Optimisation of the pSCI "Lippe flood plain between Hamm and Hangfort"
2006	Germany	LIFE06 ENV/D/000485	Demonstration Plant in the Kinzig River: Moveable Hydroelectric Power Plant for Ecological River Imp
2006	Germany	LIFE06 NAT/D/000006	Swabian Danube valley
2003	Hungary	LIFE03 ENV/H/000280	Sustainable use and management rehabilitation of flood plain in the Middle Tisza District
1997	Israel	LIFE97 TCY/IL/044	Restoration of the rivers in Israel's coastal plain
1997	Italy	LIFE97 NAT/IT/004089	N.EC.TO.N Project (New Ecosystems on the Noce River) : urgent action for renaturalisation in the La Rocchetta biotope (Trentino, Italy)
1997	Italy	LIFE97 NAT/IT/004134	Restoration of alluvial woods and oak woods along the Ticino River
2000	Italy	LIFE00 ENV/IT/000065	Planning and implementation of integrated methods for restoration of the catchment in Val Sellustra
2000	Italy	LIFE00 NAT/IT/007268	Conservation of *Salmo marmoratus* and Rutilus pigus in the River Ticino
2002	Italy	LIFE02 NAT/IT/008572	Toce River: conservation of riparian habitats in favour of breeding and migratory birds
2004	Italy	LIFE04 ENV/IT/000503	Serchio River alimented well-fields integrated rehabilitation
2005	Italy	LIFE05 NAT/IT/000026	Urgent conservation actions for Fortore River pSCI
2000	Latvia	LIFE00 ENV/LV/000961	Innovative methods of Barta river basin management system
2002	Latvia	LIFE02 ENV/LV/000481	Elaboration of a new comprehensive Ziemelsuseja River Basin Management System based on ecosystem approach
2002	Malta	LIFE02 TCY/MA/029	Protection of biodiversity and water resources in the Moulouya River Basin (MRB)
2004	The Netherlands	LIFE04 NAT/NL/000202	Tiengemeten, restoration of freshwater tidal area in the Haringvliet estuary, the Netherlands
2006	The Netherlands	LIFE06 NAT/NL/000078	Restoring migration possibilities for 8 Annex II species in the Roer
1997	Portugal	LIFE97 NAT/P/004075	A conservation strategy for *Anaecypris hispanica*
1999	Romania	LIFE99 NAT/RO/006429	Survival of Romanichthys valsanicola
2000	Romania	LIFE00 ENV/RO/000986	The protection of RIVER LIFE by mitigation of flood damage
2003	Romania	LIFE03 ENV/RO/000539	Development of an Integrated Basin Management System in order to correlate water quality and quantity analysis with socio-economical analysis, using Open-GIS technology
1996	Spain	LIFE96 NAT/E/003098	Restoration of riparian ecosystem in the natural reserve of Galachos, Spain
1999	Spain	LIFE99 ENV/E/000278	River agreements: design and implementation of fluvial management policies in the Mediterranean European
1999	Spain	LIFE99 ENV/E/000347	International restoring project for the Miño river: an example of sustainable hydroelectrical development
1999	Spain	LIFE99 NAT/E/006333	Biodiversity conservation and recovery in the river basin of Asón
1999	Spain	LIFE99 NAT/E/006343	Restoration of an integral reserve zone in the SPA for birds "Riberas de Castronuño"
2000	Spain	LIFE00 ENV/E/000425	Model for Restoring and Integrating water resources in a mining area. Actions for alternative development
2000	Spain	LIFE00 ENV/E/000539	Sustainable management, at local level, of the alluvial aquifer of the River Tordera, through the reuse of waste water
2000	Spain	LIFE00 ENV/E/000547	Design and Application of a Sustainable Soil Management Model for Orchard Crops in the Doñana National Park Area
2003	Spain	LIFE03 ENV/E/000149	New public uses in management and planning of basin resources
2005	Spain	LIFE05 NAT/E/000073	Ecosystemic management of rivers with European mink
2004	Sweden	LIFE04 NAT/SE/000231	Freshwater Pearl Mussel and its habitats in Sweden
2005	Sweden	LIFE05 NAT/S/000109	From source to sea, restoring River Moälven
2005	United Kingdom	LIFE05 ENV/UK/000127	Maintaining quality urban environments for river corridors users and stakeholders
2005	United Kingdom	LIFE05 NAT/UK/000143	River Avon cSAC: demonstrating strategic restoration and management

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LIFE-Focus brochures

A number of LIFE publications are available on the LIFE website:

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LIFE and the marine environment (2006 – 54pp. ISBN 92-79-03447-2- ISSN 1725-5619) *http://ec.europa.eu/environment/life/infoproducts/marine/marine_lr.pdf*

LIFE and European forests (2006 - 68pp. ISBN 92-79-02255-5 - ISSN 1725-5619) *http://ec.europa.eu/environment/life/infoproducts/forests/forest_lr.pdf*

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Other publications

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The programme

Name LIFE ("L'Instrument Financier pour l'Environnement" / The financial instrument for the environment)

Type of intervention co-financing of actions in favour of the environment in the twenty-seven Member States of the European Union, in the candidate countries who are associated to LIFE and in certain third countries bordering the Mediterranean and the Baltic Sea.

LIFE is made up of three thematic components: "LIFE-Nature", "LIFE-Environment" and "LIFE-Third countries".

Objectives

> with a view to sustainable development in the European Union, contribute to the drawing up, implementation and updating of Community policy and legislation in the area of the environment;
> explore new solutions to environmental problems on a Community scale.

Beneficiaries any natural or legal person, provided that the projects financed meet the following general criteria:

> they are of Community interest and make a significant contribution to the general objectives;
> they are carried out by technically and financially sound participants;
> they are feasible in terms of technical proposals, timetable, budget and value for money.

Types of project

> Eligible for LIFE-Environment are innovative pilot and demonstration projects which bring environment-related and sustainable development considerations together in land management, which promote sustainable water and waste management or which minimise the environmental impact of economic activities, products and services. LIFE-Environment also finances preparatory projects aiming at the development or updating of Community environmental actions, instruments, legislation or policies.
> Eligible for LIFE-Nature are nature conservation projects which contribute to maintaining or restoring natural habitats and/or populations of species in a favourable state of conservation within the meaning of the "Birds" (79/409/EEC) and "Habitats" (92/43/EEC) Community Directives and which contribute to the establishment of the European network of protected areas – NATURA 2000. LIFE-Nature also finances "co-op" projects aiming to develop the exchange of experiences between projects.
> Eligible for LIFE-Third countries are projects which contribute to the establishment of capacities and administrative structures needed in the environmental sector and in the development of environmental policy and action programmes in some countries bordering the Mediterranean and the Baltic Sea.

Implementation

Every year, the Commission publishes a call for proposals of projects to be co-financed.The Commission evaluates these proposals and selects those that will be co-financed. It closely monitors these projects and supports the dissemination of their results.

Period covered (LIFE III) 2000-2006.

Funds from the Community approximately EUR 638 million for 2000-2004 and EUR 317 million for 2005-2006.

Contact

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