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FINAL REPORT

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LIFE PROJECT NAME
Integrated river basin management – a network for optimised water management, rehabilitation and protection of aquatic ecosystems in Karjaanjoki area

Data Project	
Project location	Suomi Finland
Project start date:	01/04/2001
Project end date:	31/03/2005 **Extension date:** 31/06/2005
Total Project duration (in months)	48 months **Extension months** 3 months
Total budget	2298183 euro
EC contribution:	1062503 euro
(%) of total costs	46,23
(%) of elibible costs	46,33

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Key-words

aquatic biodiversity, carrying capacity, fish stock surveys, forestry planning, hydrology, land use planning, monitoring, nature survey, network of associates, remote sensing, sustainable use, volunteer monitoring, water model, water protection, water restoration, waterbody, watercourse management, zoobenthos

Abbreviations

WFD	EU Water Quality Framework Directive
HBV	A hydrological model
VirSu	The method of sustainable recreational use of nature
SWAT	Soil and Water Assessment Tool
LUOTSI	Geographic ingormation system of forestry
WISU	Cultivation software

2. EXECUTIVE SUMMARY

The Karjaanjoki Life project (INNOWA) aimed at developing efficient methods for the Karjaanjoki watercourse management. The aim was to ensure a good ecological condition, an improved aquatic biodiversity, and restoration of the aquatic ecosystem as well as sustainable use of the watercourse. The Water Framework Directive, which will change the monitoring systems in the future, formed the background to the project.

The project consisted of seven sub-projects, aiming at an efficient exchange of experiences and information between them, and with other associates within the network. The network included local residents, community organisations, researchers, authorities, polluters and all municipalities of the area. Each sub-project worked closely with each other.

Ecological restoration of running waters (WP 2.1) The status of streams was studied and novel methods were applied to sample site restoration. The information gained from this was used for developing a restoration plan covering the whole Karjaanjoki river system.

Improving the functional value of Lake Lohjanjärvi (WP 2.2) In the Lake Lohjanjärvi area effective and cost-efficient methods for watercourse management based on volunteer observations were developed. Mathematical water models, surveys on fish stocks, remote sensing, and volunteer lake monitoring was utilised and developed. Innovative methods were applied to combining these with the existing data on water quality and measurements.

Master plan for Mustionjokilaakso (WP 2.3) Solutions for decreased loading were searched for in land use management by assessing the ways in which the information gathered could be implemented in the development of land use management. Possibilities for using recommendations and regulations in land use management in water protection were assessed.

Water pollution control methods in agriculture (WP 2.4) The project aimed at decreasing loading by reducing the usage of fertilisers. This was done by nutrient balance calculations developed by the project. In addition, a novel model for environmental management self-surveillance system was developed in co-operation with farmers.

Water pollution control methods in forestry (WP 2.5) Forest management plans was improved so that its adverse effects caused by forest cutting and drainage ditching on small water bodies can be predicted and prevented. A catchment area model was developed. The methods of water protection were advanced by developing tools and methods for forestry planning, e.g. a map program, soil surveys and mapping of areas sensitive for erosion.

Planning of sustainable recreational use of the Karjaanjoki river basin (WP 2.6) Planning of sustainable recreational use of nature was developed by project. Nature and recreational values and possible conflict sites of a target area can be identified easier by using the method. Developing an evaluating method for estimating the carrying capacity of the recreational sites will protect the area's environmental and recreational values.

Development of river basin monitoring systems (WP 2.7) The watercourse monitoring system was improved so that the requirements by the WFD and regional needs are met in the future, the main focus being on the surveillance monitoring of the waterbody. The EU Habitats Directive's monitoring requirements were taken into account. Monitoring result's utilisation and co-operation between citizens, authorities and associates was enhanced. The project tested also the national criteria for typology and classification definitions of the WFD and proposed some development needs.

3. INTRODUCTION

The aim of the project was to develop a cost-effective and flexible action plan for water management, monitoring and protection. The main objectives were (1) preserving and improving the good ecological status of the watercourse and acknowledging the biodiversity, (2) restoring the aquatic ecosystem and (3) ensuring a sustainable use of the whole river system. This project provided a multi-faceted approach to various factors and their effects on the watercourse covering the whole river system across administrative boundaries. The aim was to ensure the fulfilment of the requirements of WFD and to apply them in practice. A wide network of associates was established for water protection activities and smooth progress of the project. Special attention was directed to involving local residents in the fieldwork.

The Karjaanjoki watercourse is the largest river basin in Uusimaa region. It consists of numerous lakes, rivers and brooks of various types and sizes. Therefore, it is an excellent area for testing new methodologies. On one hand, this versatility creates many difficulties for the management and understanding of the waterbody, and on the other hand, it also offers great challenges.

Cost-efficient methodologies were formulated for restoration, rehabilitation and maintenance of the watercourse or parts of it. One of the aims was to integrate existing methods and management activities and thus increase the cost-effectiveness. For example combining mathematical models, remote sensing and volunteer monitoring.

Problems in the Karjaanjoki river system for which the project developed solutions:

- Lack of management and understanding of the status of the river system
- Numerous sources of pollution in the area decrease the water quality in running waters and in lakes (nutrients, suspended solids, non-point and point-pollution)
- Changes in the morphology of running waters, e.g. channelisation and harmful constructions
- Lack of information flow

Challenge for the Karjaanjoki river system is provided by its endangered and rare animal species, especially freshwater pearl mussel *Margaritifera margaritifera*, thick shelled river mussel *Unio crassus* and otter. Also the native trout populations of the watercourse are unique. The status and improvement of their living conditions were studied.

Project goals summarised:

Sub-project 1. Restoration of rivers and brooks: Aims

This sub-project developed methodologies for determining and monitoring the ecological status of stream ecosystems. These methodologies focused on collecting data regarding the morphology, functioning and biota of rivers. In addition, some demonstration sites were chosen and novel methods were implemented to their restoration. On the basis of collected data and experiences acquired, a restoration plan for the watercourse was formulated. This plan covered the whole river system. By efficiently managing the entity, the aim was to improve the status of the watercourse in a structured and efficient way.

Sub-project 2. Improving the functional value of Lake Lohjanjärvi: Aims

The objective of this project was to obtain a better understanding and management of the Lake Lohjanjärvi and its catchment area. All data acquired will be used to improve the functional value of Lake Lohjanjärvi and applied to restoration activities in different parts of the catchment area. The goal was to create a mathematical management and usage model for the watercourse that is both cost-efficient and effective. The project utilised and created water typology methodologies, fish stock surveys, remote sensing, and volunteer monitoring. Novel methods were applied to combining these with the existing data on existing data, water quality and water measurements

Another important objective was to establish a comprehensive network of associates consisting of people who either cause loading to, benefit from or live along the shores of Lake Lohjanjärvi. This network also included various research parties and authorities. One aim was to involve the residents along the shores intensively and in large numbers in the field studies.

Sub-project 3. Master plan for Mustionjokilaakso: Aims

This sub-project aimed to improve the incorporation of water conservation in the land use planning thus enhancing the protection of water ecosystems and decreasing the pollution in the area. New markings and recommendations regarding water protection within land use plans were created. The land use planning was an interactive and participatory process.

Sub-project 4. Water pollution control methods in agriculture: Aims

The name of this sub-project was changed from Reduction in agricultural nutrient runoff by means of specified field cultivation to Water pollution control methods in agriculture. The objectives for this sub-project were a reduction in the nutrient load from agriculture on the watercourse by means of specified field cultivation and the development of a new self-surveillance model for farms to be used as a basis for evaluating the environmental aspects of farming. Studies have shown that the reduction of nutrient run-off is most beneficial and cost-efficient if started already during the field cultivation by, for example, reducing the amount of fertilizers. Existing methodologies and results were utilised and further improved. The field parcel based nutrient balance calculation method created by the Sustainable Agriculture in the River Vantaa Area -project was developed further. A field nutrient balance calculation feature was added to the WISU agricultural planning software, thus making it possible to create fertilization and cultivation plans, field parcel based records and nutrient balance calculations with one unique software.

Another goal was to establish an active network of associates, involving local and public administrative bodies (environmental and agricultural authorities), advisory bodies and farmers and their representative organisations.

Sub-project 5. Water pollution control methods in forestry: Aims

The name of this sub-project was changed from Integration of forestry water preservation plans into regional forestry planning to Water pollution control methods in forestry. The aim of this sub-project was to develop a forestry planning system that will benefit water protection in general. The idea was to combine regional forestry planning with water protection planning that includes e.g. soil and especially soil mapping of erosion sensitive soil types. Data gathered by forestry planning and soil mapping would be

utilised for a mathematical load calculation model, which could be used to estimate loading levels and the effects of loading on the downstream watercourse.

Sub-project 6. Sustainable recreational use: Aims

This sub-project developed a plan for sustainable recreational use of the Karjaanjoki river system. The objective was to protect the environmental and recreational values of the area by creating an evaluation method for estimating the carrying capacity of the location and for providing guidelines for directing the recreational use to appropriate areas acknowledging the prerequisites. The monitoring system was also further improved. Also a network of nature travel associates was established.

Sub-project 7. Development of watercourse monitoring systems: Aims

The aim of the sub-project was to develop watercourse monitoring to ensure the fulfilment of the WFD requirements and the regional needs. Monitoring requirements of the EC Habitats Directive were also taken into account. Mandatory monitoring is an essential part of monitoring on Karjaanjoki river basin and was therefore included in development work. The utilisation and dissemination of the monitoring results and co-operation between citizens, authorities and associates was enhanced.

This project tested the national criteria for typology and classification definitions of WFD and proposes of possible development needs. The existing biological data was gathered and utilised for the development of the classification.

The development of the monitoring system sub-project also utilised the results obtained by other Karjaanjoki LIFE sub-projects. Other sub- projects studied, for example, the applicability of the results of volunteer monitoring, remote sensing methods and mathematical models. In addition, they gathered more biological data especially regarding smaller stream waters, and this data was implemented in the development work of the monitoring system.

4. FRAMEWORK OF THE LIFE PROJECT

Project administration:

The project organisation is to be found in appendix 1. The project was supervised and managed by the management team consisting of representatives of the beneficiaries, partners and financiers. Each party ensured that the project was proceeding according to the project plan, within the defined project schedule and financial framework. The project management team had 11 meetings and consisted of 33 members and their substitutes, approximately 60 members in total.

Each working team consisted of sub-project partners, financiers, people responsible for the practical work and experts in that particular field. Seven working groups had approximately 150 members in total. It was the responsibility of the sub-project manager to ensure that the sub-project was proceeding according to the project plan. The sub-project managers reported regularly to the project manager. In addition, the sub-project managers formed a team to coordinate all project activities, combine sub-projects activities and ensure that cross-activities were working. The working group invited representatives of partners or experts for consultancy in the meetings if needed. The system of sub-project managers, working teams etc. was found effective.

Different teams had meetings as follows: Restoration of rivers and brooks, 7 meetings; Improving the functional value of Lake Lohjanjärvi, 28 meetings; Master plan for Mustionjokilaakso, 8 meetings; Water pollution control methods in agriculture 12 meetings; Water pollution control methods in forestry 13 meetings; Sustainable recreational use, 16 meetings; Development of watercourse monitoring systems, 6 meetings; team of sub-project managers, 18 meetings. In addition, many teams had sub-teams focusing on special questions related to the sub-project. These teams had tens of meetings and memos of these meetings have not been written, as they have been considered unnecessary.

Project headquarters in Lohja managed the practical work, financial framework and project proceeding in general. The Karjaanjoki LIFE project manager Mr. Risto Murto and project assistant Mr. Esko Vuorinen were responsible for the carrying out of the project, its coordination and financial monitoring. They also participated in the practical work of different sub-projects. A part-time employee was employed for managing the administrative duties in the office.

Furthermore, various experts were employed for different tasks in the project. Both the beneficiary and partners had employed people. This project has employed over 150 people for 380 months (36 years) in total. Also the project has provided practical training for 4 trainees, and 2 students have prepared their thesis or diploma within the project. This can be considered as a good achievement.

Beneficiaries and partners:

City of Lohja:

- Project beneficiary, was responsible for the carrying out of the project, its practicalities, administration and financial estimates and all reporting to the EU commission

- People employed for the whole duration of the project: project manager Mr. Risto Murto, project assistant Mr. Esko Vuorinen and sub-project manager Ms. Ulla-Maija Hyytiäinen and part-time secretary Ms. Merja Tapio.

The project included 27 partners and 5 financiers. All parties were involved in the project during the entire duration of the project. No significant changes took place regarding to the original project plan. Technical proceeding of the project took place according to the plan. Slight changes in the contribution of a few partners occurred during the project. These changes did not affect in any ways the original project plan and accomplishment of the tasks. The project was carried out according to the original plan and the tasks planned were accomplished. These changes have been reported to the Commission according to the instructions and it has been stated that the changes were minor when considering the entire contribution of the partners.

Partners participated in the sub-projects and their practical work according to the project plan. All parties were responsible for coordinating the sub-projects, exchanging and disseminating information and administration.

Financiers had their representatives in the management team and if required, also in the sub-project they are financing. This ensured that they were able to supervise the directing of funds to different tasks, and also to participate in the practical work. This method was found effective and all partners were satisfied with the management of the project.

Partners (27 pcs):

- The following municipalities along the watercourse: Karjaa, Karjalohja, Karkkila, Loppi, Nummi-Pusula, Pohja, Sammatti, Somero, Tammisaari and Vihti.

- The following research and development institutes: Tapio (The Forestry Development Center), Metla (The Finnish Forest Research Institute), ARAC (The Pro Agria Group of Rural Advisory Centres), RKTL (The Finnish Game and Fisheries Research Institute) and SYKE (The Finnish Environment Institute) with two separate units.

- The following governmental authorities or similar: Metsäkeskus HU - Hämeen-Uudenmaan metsäkeskus (The Häme-Uusimaa Forestry Center), KSC - Kustens Skogscentral (The Coastal Area Forestry Center), Pojo fo - Pojo Fiskeområde (The Pohja Fishing District), Hämeen liitto (The Häme Region), TE-keskus (The Employment and Economic Development Centre For Uusimaa) ja UUS (The Uusimaa Regional Environment Centre).

- The following NGO's or similar: UYSP - Uudenmaan ympäristönsuojelupiiri (The Uusimaa Group for Nature Conservation), UVY - Uudenmaan virkistysalueyhdistys ry ("The Society for Uusimaa Recreational Areas"), VIRHO - Virtavesien hoitoyhdistys ry. ("The Creek and River Management Association") and WWF Suomi (World Wildlife Fund – Finland).

- The following company: HKV – Helsingin Vesi (Helsinki Water)

Financiers:

- The following companies or businesses: Fortum (Fortum Power and Heat Corp.), Loparex Oy (former Lohjan Paperi Oy), M-real Ltd (former M-S Kirkniemi - Metsä-

Serla Oyj Kirkniemen tehtaat / Kirkniemi Mills) and VY - Vihdin Yrityskeskus Oy (Vihti Business Center Ltd.)

- The following regional council: UML (The Uusimaa Regional Council)

The roles of partners and financier in different sub-projects:

Sub-project 1. Restoration of rivers and brooks

The Lohja Town was the sub-project manager for this sub-project. Most important partners were UUS and RKTL. All municipalities except Tammisaari contributed to the sub-project. VIRHO played an important role in this sub-project, for example, by carrying out voluntary restoration work of rapids and demonstration sites. The Employment and Economic Development Centre For Uusimaa, The Pohja Fishing District and Helsinki Water were the experts in water and fish related subjects. Other experts in the sub-project were the WWF-Finland, UYSP and the Häme Region. The Uusimaa Regional Council, M-real Ltd and Fortum Power and Heat Corp funded the sub-project.

Sub-project 2. Improving the functional value of Lake Lohjanjärvi

The Lohja town was the sub-project manager for this sub-project. Two separate units of SYKE had an important role in developing the mathematical models and remote sensing. UUS was the most important actor gathering and distributing biological data as well as possessing the expertise on the watercourse. The municipalities of Lohja, Karjalohja, Karkkila, Karjaa, Nummi-Pusula and Sammatti contributed to the project. Other financiers were UML, M-real Ltd and Loparex Oy.

Sub-project 3. Master plan for Mustionjokilaakso

The Karjaa town was the sub-project manager for this sub-project. The sub-project was carried out in co-operation with the municipality of Pohja. UUS and UML financed and participated in the activities of this sub-project. The Lohja Town supervises the sub-project. The role of the partners was carried out according to the project plan and no changes took place during the project.

Sub-project 4. Water pollution control methods in agriculture

The Uusimaa Pro Agria Rural Advisory Centre was the sub-project manager for this sub-project. The municipalities of Lohja, Vihti, Karkkila and Nummi-Pusula contributed to the project. ARAC was responsible for developing the field parcel based nutrient balance calculation programme. UUS lent its expertise to this sub-project. The Lohja Town supervised the sub-project. The role of the partners was carried out according to the project plan and no changes took place during the project.

Sub-project 5. Water pollution control methods in forestry

Tapio was the sub-project manager for this sub-project, duties including coordination of and responsibility for the practical implementation of the project as well as collaboration with Metla, SYKE, UUS, Metsäkeskus HU and KSC. Tapio was also responsible for providing the budget and reports of the forestry sub-project to the project headquarters. Also, the development of forestry planning and forestry soil mapping were the responsibility of Tapio. SYKE was responsible for modelling, and Metla was responsible

for gathering, analyzing and compiling reports on water samples. Metsäkeskus HU was responsible for the practical realization of the forestry planning in this the sub-project. All these institutes collaborated in developing different issues related to water protection within forestry planning. Forestry Centres are responsible for providing training for personnel in forestry management and forest owners. The sub-project was supervised by Lohja. The roles of the partners responded quite well to the original project plan. The forestry planning took place in a smaller area than originally planned. This however, did not have an influence on the development of the method.

Sub-project 6. Sustainable recreational use

The Lohja Town was the sub-project manager for this sub-project. All municipalities in the area contribute to the project, some participate in the voluntary work. TE-keskus and UVY contributed considerably to the sub-project, especially in planning and realisation of the demonstration sites. The Häme region, The Pohja Fishing District and UYSP participated in the activities and lent their expertise to the sub-project. UML and Vihti Business Center Ltd. were financing the sub-project.

The roles of partners corresponded the project plan quite well. The municipalities of the area took part in the project activities better than expected. Especially the tourism management and park maintenance sections in different municipalities were actively involved. Also the local nature travel entrepreneurs have been involved in the project activities. Also connections to the Häme Region were established. The Pohja Fishing District, The Employment and Economic Development Centre For Uusimaa, UVY and UYSP managed their duties satisfactorily.

Sub-project 7. Development of watercourse monitoring systems

UUS acted as the sub-project manager for the sub-project 7, co-ordinating and managing the practical work and leading the team. UUS was also responsible for providing the budget and reports of the sub-project to the project headquarters. The Lohja town supervised the sub-project.

5. TECHNOLOGY

Sub-project 1. Restoration of rivers and brooks

The fieldwork methodologies for studying running waters provided an effective means for gathering essential and significant data on the river morphology, functioning and biota. The methodology aims firstly to correspond to the needs of species conservation (brown trout and freshwater pearl mussel). It also aims at fulfilling the WFD requirements regarding the estimation of the status of rivers and their classification.

The data gathered and organised in databases were analysed and formulated into a final plan. The focus of the general plan was on providing means for prioritising different actions by their urgency and applicability. To ensure the implementation of the plan it was made as intuitive and concrete as possible.

Sub-project 2: Improving the functional value of Lake Lohjanjärvi

Volunteer monitoring results, including Secchi transparency measurements and algal bloom observations, were combined with satellite images used in remote sensing. The aim was to develop a novel method for water quality monitoring.

For the first time, fish stock surveys were accomplished at such large scale. The implementation was participatory, meaning that the local residents and representatives of fisheries societies took part in handling the catch. The objective was to determine whether this methodology could be applied to the laborious monitoring of fish stocks on a larger scale.

The identification and calculation methodologies used in the monitoring of cyanobacteria have not been coherent. The project also estimated the reliability of different methods for monitoring the cyanobacteria. This was done in collaboration with the sub-project 7.

Two models, a catchment area model and a three-dimensional lake water quality and ecosystem model were applied to the Lake Lohjanjärvi. The models were used for water quality monitoring as well as for simulations. Mathematical models were utilised for predicting the impact of the planned buffer zones on water quality of the watercourse. This was accomplished in collaboration with the sub-project 7.

Sub-project 3. Master plan for Mustionjokilaakso

A Master plan was prepared for the Mustionjokilaakso area according to the project plan. The Master plan reaches partly to the City of Karjaa (122 km²) and Pohja municipality area (20 km²). This covers the catchment area near river Mustionjoki, and this area was considered to be important in terms of water protection. This sub-project developed and evaluated water protection methodologies and activities related to land use planning. The weaknesses of the present method were evaluated and new activities that need to be incorporated in the land use planning were introduced. Furthermore, markings and recommendations regarding water protection within general plans were developed. The basics of land use planning were disseminated widely to residents and associates within the area. Open dissemination of information aimed at enhancing a positive exchange of ideas. The sub-project also tested applying the loading model (cross-exchange with sub-project 2.) for evaluating different land use options.

Sub-project 4. Water pollution control methods in agriculture

Wisu- software was developed in the sub-project. The use of nutrients can be optimised by using Wisu. The software makes it possible to create fertilization and cultivation plans, field parcel based records and nutrient balance calculations. This decreases overall costs and water pollution by nutrients based on the results from nutrient balance calculations. The field parcel based nutrient balance calculation method created by the Sustainable Agriculture in the River Vantaa Area project is being developed further by other current national projects. An active network of associates, involving local and public administrative bodies (environmental and agricultural authorities), advisory bodies and farmers and their representative organisations was established by the project.

Sub-project 5. Water pollution control methods in forestry

This sub-project developed a forestry planning system that is in use throughout the country. This method notifies the special sites of aquatic nature and especially the water protection objectives of forestry. Soil mapping system and the Luotsi-mapping program, based on geographic information systems, were further developed by the sub-project. A mathematical calculation model for predicting forestry loading was developed. A network of associates was improved by the sub-project.

Sub-project 6. Sustainable recreational use

The project's objective was to protect the environmental and recreational values of the area by creating an evaluation method (VirSU) for estimating the carrying capacity of the location and for providing guidelines for directing the recreational use to appropriate areas acknowledging the prerequisites. This method will provide means for determining the types of recreational use appropriate for a particular site, so that the use will not endanger or decrease the natural and recreational values. In addition, it also provides information on preventive methods and courses of action.

This sub-project developed a plan for sustainable recreational use of the Karjaanjoki river system. The plan was made together with local entrepreneurs, municipalities, authorities and experts. The sub-project worked also in co-operation with sub-project 3. The plan included carrying out of demonstration sites, in which the plan method, VirSU, was used.

Also a network of nature travel entrepreneurs and associates was established.

Sub-project 7. Development of watercourse monitoring systems

This sub-project aimed at producing a coherent monitoring system, which will be accomplished together with local municipalities, UUS and other associates. The mandatory monitoring program forms an important part of the monitoring plan. Also the utilisation of volunteer monitoring results will be improved in the future. Remote sensing and modelling done by the sub-project 2 were utilised when working on the monitoring plan. The monitoring requirements of the EU Habitats Directive and WFD were combined by the sub-project and information was produced regarding the implementation of the WFD on a national level.

6. PROGRESS AND RESULTS

Sub-project 1. Restoration of rivers and brooks -results

The Sub-project 1 has conducted stream surveys, evaluations of restoration needs and restorations. Based on the experiences gained in the fieldwork, methodologies were improved, especially the stream survey method.

Stream survey method development the main focus was in the methods by which the ecological status of rivers can be estimated. Hydro-morphological and biological data was gathered. The method is described and it's usability and benefits evaluated in appendix 2.

Stream surveys were conducted in the entire Karjaanjoki river basin area. Surveys took place in 330 different running waters (31% of all running waters in the area), with total 370 km were surveyed. 14 employees were involved in this work. Experiences implied that good results can be gained by creating a master form that can then be personalised for each worker according to their abilities and skills. For example, the forms used in collecting data on the biota can either include a comprehensive list of all species or a shorter list including only the most important water status indicators. Good indicators are also easily identified and found (appendix 2). The surveys were conducted between 2001-2004, with emphasis of fieldwork on year 2004.

Species surveys were conducted together with stream surveys for obtaining a wider picture of the nature values in the area:

(a) **fish stocks**: Electric fish stock surveys were conducted at 90 sites, and over ten natural trout populations were found; the data was analysed and the trout DNA analyses were completed (except for trout stocks which were surveyed in the autumn 2004); RKTL (The Finnish Game and Fisheries Research Institute) was responsible for electric fish stock surveys; fish stock surveys planned for the autumn of 2002 were not completed because the rivers froze exceptionally early. However, this did not prevent the realisation of the plan because the sites planned for 2002 were studied during the autumn of 2003, and accordingly the sites for 2003 were studied during the autumn of 2004; the final report of fish stock surveys will be ready in the autumn of 2005 and the final report in 2005. The DNA report is included at the final report.

(b) **other vertebrates:** Approximately 140 river and stream reaches were studied during winters, and observations were made especially on otters, minks and white-throated dippers; Lohja and UUS (The Uusimaa Regional Environment Centre) completed the inventory; there are approximately 20 otters in the area (in 2003 21 individuals); the mink population is decreasing possible due to increase in the number of otters; the report was finished in 2003.

(c) **crayfish:** Crayfish sampling took place at the Lapoonjoki demonstration site in the autumn of 2002 before the restoration works; crayfish sampling was performed by UUS; report was finished in 2002

(d) **unionids**: Approximately 24 km of the River Mustionjoki was studied; field work was carried out in 2001 and 2003; the Helsinki University/ The Finnish Museum

for Natural History was the responsible body; the aim is to finish the report during autumn 2005

(e) **zoobenthos:** 15 river and brook reaches were studied during the summer of 2002, the report has been finished

(f) **aquatic plants:** Data on plants was collected together with stream surveys (mosses, umbelliferous plants, macroalgae in a lesser extent)

(g) **dragonflies**: approximately 10 running water sections were surveyed in 2004. The reports were finished in 2005.

Evaluation for restoration needs i.e. a hydro-morphological survey, included all rivers and majority of the streams in the area. The evaluation for restoration needs was conducted both simultaneously with stream surveys and independently. The findings of the survey were that the main problems in the area are caused by numerous weirs and dams. These include both dams and weirs of the main channels as well as those of small tributaries. These form obstacles for the migration of fish and other aquatic species. Also other structural obstacles, especially culverts that are installed in a wrong way, cause problems for the fauna. Over 100 harmful obstacles were found in the streams and rivers of the area. Majority of the dams and weirs were illegal. Most of these were located in streams, although one was found in a river. Despite of the one illegal dam, in rivers the dams all had a permit. In addition to these obstacles that split the channels into smaller sections, also the decrease in the natural state of the streams cause a problem. The channels are strongly modified by human action, e.g. nearly 70% of the running waters in the area are changed by channelisation and drainage.

Data from surveys was entered into a **database**, which is available for authorities and for others interested in streams and rivers. A **general plan** was made for the restoration of rapids and streams closer to their natural state. The plan covers the entire river basin.

Restorations were conducted in the headwater region in 2002-2004. Restoration plans have been implemented in Karkkila, Loppi, Nummi-Pusula and Vihti. Over 23 restoration actions took place: five dams have been taken down, three fish passages have been built, nine dams have been transformed into manmade rapids and five river sections with a degraded natural state have now been restored. One of the sites was restored by building a dam into a ditch in a mire area. The Karjaanjoki LIFE project was responsible for preparations, permits, planning and supervision of work. Building expenses was covered by other than LIFE funding. VIRHO was responsible for the supervision of work in restoration areas. The restoration work directed by VIRHO, will continue until the end of 2005 or possibly even further.

Sub-project 2: Improving the functional value of Lake Lohjanjärvi

A method for volunteer monitoring was developed for the area (see appendix 3). The network included approximately 100 volunteers. The local residents measured the Secchi transparency, monitored the occurrence of algal blooms and when necessary, took algal samples as well. The results were reported to the project via Internet using the new completed map-based system that was developed during the project. The volunteer monitoring has provided profound information on the differences in water quality in relation to both location and time. This information was utilised for mathematical modelling and remote sensing. In addition, sub-project 7 obtained information of the applicability of voluntary work force in watercourse monitoring. Training and guidance

has been provided for the volunteers. The Lake Lohjanjärvi project organised regional meetings for opinion and information exchange in various parts of the research area. Support and expertise has been given to voluntary restoration activities, for example, for aeration of small waters. The project did not give courses on fish traps, as they were not considered necessary by the project.

Fish stock surveys were completed during the summer of 2002. The original project plan for fish stock surveys was the year 2003 but because of regional planning of maintenance and restoration activities, the schedule was changed. Reports on fish stock surveys, echo sounding of fish stocks and the questionnaire related to Lake Lohjanjärvi fishing and maintenance have been completed. (Appendix 4).

Approximately 450 volunteers participated in the fish stock surveys during the summer 2002. In addition to the locals, pupils were also introduced to the project. This was the first time the methodology has been implemented in such a large water body. Valuable information on the economic resources and workload was gained, and this enables evaluation of the future applicability of this method to fish stock monitoring. Fish stock surveys done with the help of volunteers were rather laborious and involved a considerable amount of organising work. In addition, the costs were rather high. According to the volunteers, participating was however meaningful. The most important result was the improved understanding of the volunteers in things related to the watercourse and water maintenance. This information was required by the sub-project 7.

The volunteers were also given a questionnaire regarding the fish stock, its structure, the status of the lake and their desires for maintenance and restoration measures to be taken. 55 persons returned the questionnaire and the results have been compiled into a report. The volunteers expressed their desire for more direct actions to be taken to improve the water quality, especially in the catchment area. They also considered the clearing of vegetation and biomanipulation to be important measures for improving the water quality.

The utilisation of satellite images together with Secchi transparency measurements taken by the volunteers for monitoring the state of surface waters gave important results. In 2002, the project had three successful days for satellite imaging, which can be considered a good result. The correlation between the Secchi transparency measurements and these images was excellent. Data from volunteer monitoring is suitable for interpretation of the satellite images since the data was very abundant and taken in various locations of the Lake Lohjanjärvi. Although adverse weather conditions and problems in functioning of the satellite had an influence on the measurements, the data was adequate enough for making assumptions of the reliability of the method. The method is being developed further and it is expected, also in wider use, to provide a novel way for combining voluntary work and remote sensing in the monitoring of the status of surface waters. (Appendix 5)

A hydrological model (HBV) was created as the basis for the modelling work of the Karjaanjoki river system. This model and predictions have been all along available at the project's Internet site. A considerable amount of research data has been gathered to enable the modelling. In the mathematical modelling, both the catchment area model and the three-dimensional lake water quality and ecosystem model have been completed (appendix 6). The information produced by the models is available at the project's Internet site. As expected, especially because of the complicated biology of the cyanobacteria, modelling often faces difficulties. An MSc thesis on the evaluation of

different methods used for identification and calculation cyanobacteria has been completed. Modelling of the impact of buffer zones has been completed in collaboration with the sub-project 7. Applicability of the loading model on land use planning was found too rough. The model can be used for planning and comparing greater plans rather than small scale plans.

Creating a guide for volunteer monitoring of the lake was not considered necessary because the guide already existed. Instead, a Management and Restoration Your Shoreline -guide was done.

Sub-project 3. Master plan for Mustionjokilaakso

This sub-project actively introduced the basic principles of land use planning to the residents and associates in the area concerned. The project communicated each step openly and this led to a positive exchange of opinions. Four general seminars regarding the master plan for separate sub-areas and background information related there were held. These seminars dealed with, for example, the survey on nature, dimensioning of building rights along the shorelines, building regulations, the future requirements for handling the sewage of scattered population, and issues related to decreasing the diffuse pollution. More information on the land use planning process and seminars were put on the project Internet site as well as on Karis, Pohja and the plan consultant's websites.

Planning was carried out in co-operation with different parties. Changes were made for the plan according to the feedback obtained. The plan draft was placed for view in Karjaa 18.10.-16.11.2004 and in Pohja 15.4.-16.5.2005.

The interactive planning process provoked discussions regarding the contents of the plan. Thus compromises regarding water protection were made: e.g. buffer zones and planned sites for constructed wetland areas were inserted only as recommendations in the plan. The written plan regulations do not prevent e.g. the fulfillment of WFD requirements. It was noticed during the planning process that separating one theme, such as water protection, is difficult. It increases the number of appeals (see appendix 7).

The project was introduced to land use planners in the Baltic countries, and this seems to inspire initiation of projects for improving the river ecosystems in Lithuania, perhaps also in Estonia.

This sub-project also conducted surveys on aquatic ecosystems and on factors contributing to the loading of the watercourse. These surveys are more detailed than those included in normal land use planning. Surveys on nature, landscape history and valuable small waters and rapid sections (cross-activity with sub-project 1), dimensioning study for construction, point pollution survey and risk evaluation survey have been completed by the subproject. In addition, the presence of the freshwater pearl mussel in Mustionjoki and side rivers was studied. The survey on nature was performed at 175 sites, covering a total of 13 km². Of these sites, six are nationally, 28 regionally and 40 locally valuable. There are 17 endangered and 29 near threatened species.

These surveys were utilized for instance in locating of constructed areas, considering dimensioning and setting up regulations. Instead of using strict regulations related to water protection, recommendations were used in the plan. All important nature sites were left inbuilt.

The influence and conditions of possible dredging was estimated based on the river mussel survey results. Locations where small scale dredging with a minimum effect could be possible were marked on the plan. Elsewhere dredging requires always a permit. This type of marking is has not been used before.

Natural small ponds, streams and springs defined by the Water Act and located during stream survey (cross-activity with sub-project 2) were marked on to the plan map by sl-symbols, meaning that these sites are not to be endangered. Often sites like these are not surveyed during plan process at all. An entire catchment area of a stream has been considered in the plan process because changes that take place in the catchment area may influence the existence of a site that is located downstream. An example of this is the channel of Brunkonbäcken stream (see attachment 7). This is also new in Master plan work.

Dimensioning of building rights has a significant influence on the landscape and pollution Mustionjoki riversides are left inbuilt. Building at valuable nature sites is prevented by careful placing of building sites. The building rights were transferred from the riversides to field areas, forested hills and nearby present residential areas.

Utilisation of the models for evaluation of different land use plans was discussed with the modelling specialists of the Lake Lohjanjärvi sub-project 2 and that was considered to be too rough. The models can be used for estimating loading if land use would change in a catchment area. This estimation was not done in this planning process because different land use options were not large enough.

Sub-project 4. Water pollution control methods in agriculture

In November 2001, approximately 350 farmers in the Lake Lohjanjärvi catchment area received an informative letter and brochure about participating in the project. Approximately 10% of the farms, numbering 33 in total, enrolled for the nutrient balance calculations. 19 of these farms are in Vihti, 12 in Lohja and 2 in Nummi-Pusula. These farms covered over 800 field parcels in total. (According to lines of production: crop farming 21 farms, pig farming 5 farms, dairy farming or meat production 4 farms, mixed farming 3 farms).

Farms were given cultivation plans for 2002 to enable the nutrient balance calculations. During the autumn 2002 and winter 2003 these farms were visited. During the visits cultivation data was entered in the field parcel based recording and nutrient balance calculations were made. All cultivation data gathered was entered in the national field parcel data bank, which enables comprehensive searches and comparisons nationwide. In April – May 2003 this data bank was used for nutrient balance comparisons within the project but also with other nutrient balance calculations made in Finland using the same methodology. The results from the nutrient balance calculations were published in a report.

New computer software (Wisu) for field parcel based cultivation planning was developed by the project (see appendix 8). The software has been in test use since the beginning of the year 2002 in the farms of this sub-project but also in other farms in Finland. ARAC, sub-project manager, has developed the software according to feedback received. This software has already been available nationwide for anyone interested. The software has been already in use for approximately in 10 000 farms nationwide. Also advisors of rural advisory centres have used the software in over 12 000 farms.

In summer 2002, farmers were interviewed regarding their opinion on the environmental support system. In addition, landscape surveys were made to identify sites qualifying for additional environmental support, and farmers' suggestions for reformation of the support system were asked. A separate report was published of the questionnaire. The report was given to the Finnish agri-environmental subsidy, which is working under the ministry of agriculture and forestry. Thus the findings were immediately available for use the Ministry of Agriculture and Forestry in renewing the agri-environmental support scheme.

In addition to the nutrient balance calculation, another example of new models aiming at developing environmental programmes in farms is the development of methods for estimating the field status. During the field visits a new form for soil status observations developed by ARAC was tested. Suggestions for improving the form were forwarded. Field status estimations and nutrient balance calculations will be key issues in the environmental maintenance programme and self-surveillance system for the farms.

A team for agriculture was established within this sub-project. The team consisted of rural employment and environmental authorities of the municipalities in the area, representative of the regional environmental centre as well as farmers and representatives of the local advisory centre. The team will be a part of the rural associates' network. It will assemble at least once a year.

The functionality of the project can be evaluated, for example, by the number and quality of the measures aiming at enhancing water preservation, amongst these the contrast for additional environmental aid to agriculture made for the Karjaanjoki river catchment during 2002 - 2004. The number of contrasts has clearly increased during the project.

Sub-project 5. Water pollution control methods in forestry

The planning phase of this sub-project was completed by August 31st, 2001. According to forestry project plan, two rather small catchments previously subject to felling of the upper reaches were chosen. The topographical, geological and basic hydrological data as well as tree stand necessary for forestry planning were studied in detail in these selected areas.

For modelling, forestry plans were created for the previously mentioned areas in the summer of 2002. Areas and dates of previous forestry measures were found out. Soil mapping of mineral soils was completed by August 1st, 2002. This gave information on sites subject to erosion. Soil mapping was done with linear and patterned sample plot assessment. The sample plots were entered in the geographic data system. Also different mapping methodologies were compared, and in addition, the mapping done was compared with the freely available soil map created by the Geological Survey of Finland.

The results gained so far can be utilised for a better incorporation of water protection planning with the regional forestry planning. Soil data gathered will facilitate the planning of various forestry measures in regard to water protection.

A continuously measuring weir equipped with a graphical recorder has measured the run-off from these sites (Thomson-weir). The measurements in Teeressuonoja were started back in the 1960s by the environmental administration. In this sub-project a measuring weir was built in Vaskijärvi in June 2002. Leaching from these sites was mainly calculated on the basis of water samples collected once a month and the amounts of run-off during 24 hour periods.

One of the aims of this sub-project was to develop a method by which the water protection actions in forestry could be improved (appendix 9). Development of soil mapping was considered as one of the important things to be developed. By soil mapping, the risk areas in terms of water protection can be identified. In connection with forestry planning, the significant data on soil was gathered (from the 0-30 cm surface layer). These sites corresponded with the sites of sample plots in forestry planning. The soil data was saved in GIS format in a GPS. For each site a detailed soil type according to the test sites was recorded. The map system of forestry planning was developed so that a soil map based on patterned sample plots can be produced from the previously described soil data recordings.

The sub-project tested SWAT (Soil and Water Assessment Tool) that can stimulate the nutrient runoff and suspended solids leached per day. The calculations of the model are based on three map-based data: inclination, soil and land use data. From these data the model is able to create a channel and catchment area network (uoma. ja osavaluama-alue verkosto). The measured leaching has been used to calibrate the mathematical leaching model (SWAT) based on the basic data (soil, inclination, land use) of the site and also meteorological and hydrological data. Since this model includes over 100 parameters, each requiring determination of numerical values, the parameterisation was rather a laborious phase. The parameters are being chosen and this phase was completed during the spring 2003. Once this phase was completed, calibration of the model and first test runs were initiated.

The model was calibrated mainly according to the runoff that was measured from the point of discharge of a catchment area. The goodness of fit of the model was obtained from the Nash-Sutcliffe criteria. Goodness of fit was 0,57.

Map based data on hydrological and geographical information can be produced from a sub catchment area with the help of the model. The sensitive areas in terms of forestry can be mapped according to the model results. The model calculates the stream network according to the given digital height data. This can be utilized e.g. in drainage ditch planning. The model also enables the calculation on different land use scenarios (e.g. changes in the number of clearings). However, the model needs still testing to work well for this type of purpose.

The effect of a single measure, such as a clear cutting in a catchment area that causes pollution, can be estimated with the model according to the requirements of the Water Framework Directive.

Sub-project 6. Sustainable recreational use (WP 2.6)

1. Preparations

This sub-project has gathered information on sites for nature travel and recreational use and their level of services. The requirements for leisure and recreational use were identified in collaboration with nature travel entrepreneurs, municipalities and various business development centres. Information gathered was entered into a database and a report on the results was published. In addition, cross-activities with sub-projects 1, 2 and 3 were realised regarding, for example, identification of fishing areas and sites with valuable aquatic ecosystems, choosing demonstration sites and developing land use planning. A preliminary network of associates regarding recreational users and nature travel was established.

2. Evaluation

The sub-project has evaluated widely the possibilities of recreational and nature travel in the Karjaanjoki river basin. The aim was to look for sites that are attractive and characteristics of the area. An extensive information package was put together of the current nature and recreational sites and the services in these. The survey was accomplished together with local municipalities, entrepreneurs and organisations. Seminars and meeting were held with them. A plan for sustainable recreational use of nature and nature travel was created based on survey results. The plan evaluates the suitability of different sites for recreational use and the developmental needs of the sites in terms of sustainable recreational use. Suitable demonstration sites were selected during evaluation.

The method of sustainable recreational use of nature (VirSu) was developed by the sub-project (appendix 10). The method offers a tool for recreational planners for completing a recreational planning so that the use of the target area does not danger or weaken the nature or recreational values of the area. This secures the sustainable recreational prerequisites also for valuable nature sites.

3. Detailed planning

The demonstration sites were carried out according to the plan, together with associates and by using the method of sustainable recreational use of nature (VirSu) (see above). The sites included a recreation site (28 ha), which is located in Karjaa and also river and lake routes. A resting site with two shelters and a dry toilet was built along the route.

4. Planning and establishing the monitoring system

Monitoring system is a part of the method of sustainable recreational use of nature (VirSu). Monitoring has been taken into account also in the detailed plans of the demonstration sites.

5. Implementation of the usage and maintenance plans for chosen sites

The selected demonstration sites were carried out in co-operation with different associates. The work was accomplished according to the plan. The sites are presented at the project's website and the sites have also been presented in the local newspapers and on the radio. The channels along the canoeing routes have been cleared from trees that have fallen into the channels. Waterway guide has been available for the public on the project's website already for two summers. The guide and the routes have been improved according to the feedback obtained from the users.

6. Evaluation of measures taken

Evaluation has been taken into account in the method of sustainable recreational use of nature. The actions taken have also been evaluated in the Sustainable nature and recreational use development plan. The entire data is based on a wide survey of attractive sites and special features. A starting point was a carrying capacity of an area for different recreational types: mass tourism, nature and adventure travel, independed travel and general recreational use.

The sub-project held national meetings and a final seminar. This was considered as a best option for sub-project.

Sub-project 7. Development of watercourse monitoring systems

This sub-project has typified the lakes of the river basin according to the Finnish typology proposal (10.4.2002) and evaluated the accuracy of this proposal, in other words how well it manages to typify the lakes according to their natural types. For the evaluation, the percentage of clay and organic soils of the lake catchments has been defined, and these have been compared with water quality of the lakes. The test results have also been forwarded to the national WFD expert group on ecological monitoring.

The results of phytoplankton, aquatic vegetation and zoobenthos surveys on the whole watercourse have been gathered. These results were utilised for the classification of the surface waters. Additional phytoplankton and zoobenthos samples were acquired from lakes around the study area. The data on phytoplankton has also been preliminarily studied for defining the classification criteria for eutrophic lakes. Data on zoobenthos has been utilised in planning the national classification criteria. Biological data and classification tests are presented in the report. Data on fish and suggestions for improvements in the fish stock monitoring have been compiled into a separate report.

The possibilities for incorporating the monitoring requirements of the EU Habitats Directive with WFD were evaluated together with persons responsible for nature conservation. Monitoring of the EU Habitats Directive have been noted in this work only by facts that were possible because the monitoring requirements of Habitats Directive are not yet known.

A seminar of monitoring needs and development possibilities was held and a questionnaire was sent for municipalities and volunteers who are working with monitoring and utilising the results from monitoring. A monitoring plan was compiled according to the development needs, gathered information, current monitoring programs and obligatory monitoring programs and available resources. The plan is presented in the final report of the sub-project 7. The monitoring resources are considered as a whole and this enables the effective use of resources in the monitoring of ecological status of surface waters. The UUS will coordinate the monitoring planning in the future.

The aims of the project were achieved mainly well. Unified monitoring plan has been established and a network for monitoring activities has been created. The application and examining of national typification and classification criteria were accomplished in a smaller scale than originally planned by the project. This was because the national criteria were not available at that time yet. Also the monitoring requirements of WFD do not exist yet. Thus the monitoring plan will be evaluated in the future and changed according to the new requirements. Also reporting, dissemination, evaluation of nature values and participation of locals requires constant development and activity. (Appendix 11)

A Summary of the most significant results of the Karjaanjoki LIFE project

1. Restoration of running waters (WP 2.1)

Surveys were conducted throughout the river basin area

- over 370 km of streams were surveyed; biological and hydro-morphological data was collected during the surveys
- restoration surveys included all rivers and majority of the streams in the area
- different species were surveyed; freshwater mussel survey was conducted along the entire length of river Mustionjoki
- electric fish stock surveys were conducted in 90 different channel sections

Surveys indicate problems and areas in need of restoration

- survey results were transferred into a database used by environmental authorities and others interested in the subject
- a restoration plan for river and stream restoration was made for the whole river basin area
- stream survey methods were developed further with the help of the experience gained from the present survey
- the aim is to have a fast and effective method for obtaining basic information of the state and restoration needs of the river system (appendix 1).

Restorations were accomplished at demonstration sites

- 20 sites were restored: channel restoration, taking down dams and weirs, making fish passages and catchment area restoration

Conclusions

- nearly 70% of streams and rivers in the river basin are channelised (cleared from stones etc. natural material) and drained
- there are over 100 man made obstacles in the Karjaanjoki river system. These prevent fish migration and therefore endanger brown trout populations in the area
- majority of the dams and weirs are built without a permit

2. Improving the functional value of Lake Lohjanjärvi (WP 2.2)

Volunteer monitoring and activation of locals

- over 80 volunteers took part in monitoring and over 2500 measurements were recorded by the volunteers
- Secchi transparency measurements and algal records were used in remote sensing and mathematical modelling
- a database for volunteer monitoring was created to serve volunteers monitoring waters throughout the country
- information sessions were held for residents and volunteers. (Meetings regarding the state of the lake and management methods were held for the locals.) Also training and management activities were organized at different parts of the lake

- A report on comparison of different management possibilities for Maikkalanselkä was written
- shore management guide was published

Four waste water surveys were carried out in the Lake Lohjanjärvi area for applying the waste water management act for scattered settlement.

- An effective method based on questionnaires and field work was developed

A novel monitoring method based on remote sensing was developed

- Secchi transparency measurement results from volunteer and official monitoring were compared for interpretation of satellite images taken from the lake

Mathematical modelling in Lake Lohjanjärvi catchment area

- modelling produces real time water quality results, pollution information and algal bloom predictions
- discharge and water level measurements can be monitored in the entire catchment area
- a scenario was produced of different sewage treatment plants discharge points and the possible effect of those on water quality in the area
- the influence of changes in land use patterns on water quality was estimated. Also effect of buffer zones on nutrient leaching was estimated by modelling

3. Master plan for Mustionjokilaakso (WP 2.3)

A master plan was prepared for the river valley Mustionjokilaakso

- surveys conducted in the area gave background information on the values and characteristics of nature and cultural landscape in the area
- a special attention was given to water nature and human impact on waters

The Master plan was conducted in interaction with landowners, locals and other associates

- the plan process was available at the municipalities' website
- ten seminars were held, of which two were theme seminars

The water protective actions and possibilities were investigated during the planning process - plan marks and regulations as well as the planning process were developed further

- surveys on aquatic nature, pollution and the state of surface waters in the area were conducted
- the use of water models for comparing different plans was examined
- more information on the means of water protection and new markings can be found from appendix 7

A wide background information was collected for estimating the effects of dredging in the river

- areas in which dredging is allowed are shown in the Master plan

The Master plan promotes and guides sustainable building in the area

- building sites are directed to forested areas

- river sides are left inbuilt and the cultural landscape is kept open

4. Water pollution control methods in agriculture (WP 2.4)

The project developed a nutrient balance program, which describes the balance between nutrients applied to a field area and the amount of nutrients that have been removed from the same area during harvest.

- calculations were performed for 33 farms, for 933 field parcels altogether

Wisu- software program was developed based on the results from nutrient balance calculations

- the use of nutrients can be optimized by Wisu. This decreases overall costs and water pollution by nutrients

A questionnaire regarding agri-environmental support scheme was sent to farmers

- results gave valuable proposals for the development of the support system

5. Water pollution control methods in forestry (WP 2.5)

Means of water protection were improved by developing tools and methods of forestry planning

- mapping of erosion sensitive areas was combined to regional forestry planning
- The project has further developed the Luotsi-mapping program, which enables mapping of the soil type and erosion sensitivity, and thus supports planning of water protection
- soil identification in forestry survey guide (Solmu- survey method) was developed further. The method enables precise soil survey together with forestry planning

Comparison of different soil survey methods

- surveys conducted in linear sample plots and those conducted in patterned sample plots do not significantly differentiate from each other
- soil maps done by Geological survey of Finland are too rough for water protection activities by in comparison to the soil survey
- International SWAT- catchment area model was applied for the first time in weather and atmospheric conditions that are typical in Finland and elsewhere in the Scandinavia.
- by using the model, it is possible to estimate the effects of land use and water protection activities to runoff
- the model indicated major runoff sites in a study area

6. Recreational use of the Karjaanjoki river basin (WP 2.6)

For the recreational and nature travel development plan

- information of the nature and recreational sites and local entrepreneurs in the area was gathered
- proposals were made for the improvement of nature travel strategies, networking, marketing and enhancement of the nature and recreational sites
- it was concluded that development of nature travel requires improved co-operation between different associates

A plan for sustainable recreational use of nature (VirSu) was developed

- in which the nature and recreational values of an ware are investigated separately, but however, as factors that are dependent on each other
- the method evaluates information by taking human impact, nature assessment, recreational values and geographic information system
- nature and recreational sites are assessed in separate map levels
- conflict situations are solved by using map levels
- cost-effectiveness is pursued for instance by surveying of nature values based on habitat types

A water way guide was published on the Internet

- the guide includes four river routes, the lake areas of Lake Lohjanjärvi and Lake Hiidenvesi and tourist attractions in the Bay of Pohjanpitäjä

Demonstration sites with nature trails, campfires were built : at Korpudden (Karjaa) and Pääkslahti (Vihti)

7. Development of river basin monitoring systems (WP 2.7)

Water load and state of surface waters were monitored and the current monitoring methods were evaluated

- current monitoring methods were evaluated in terms of ecological status of surface waters
- current biological data was gathered together, e.g. fish data

Examples of typification and classification of surface waters were done according to the requirements by the WFD (e.g. based on biological data)

- information was produced for the application of the WFD at national level
- the possibilities for bringing together the surface water monitoring requirements by the WFD and Habitat Directive was investigated

Information availability and problems in that were assessed and suggestions for improvement were made

- a website was established, which included monitoring results and other related information of the Karjaanjoki river basin
- an environmental web database of the environmental administration was developed further (Hertta database)

A plan for surface water monitoring, co-operation and reporting of results was drawn together

- the aim is towards continuous and coordinated co-operation
- biological monitoring will be increased and novel methods and strategies will be used
- effective and easy reporting methods will be taken into use
- results from volunteer monitoring will be utilized more carefully
- obligatory monitoring and other monitoring will be reconciled

7. DISSEMINATION ACTIVITIES AND DELIVERABLES

Principles of dissemination activities and deliverables

A great variety of methods have been used for dissemination activities. The target group has changed depending on the content of the produced information. The main goal has been to disseminate the most significant and innovative results of the project and the implementation of those in Finland and elsewhere in the EU. Dissemination activities have been able to direct exactly to those who need the information due to the exceptionally wide network of partners.

The most important dissemination methods are direct contacts with experts, seminars and conference, newspaper articles, radio, television, Internet. Publications produced by the project are available for all in a pdf-format at the project's Internet site. These publications have been delivered to experts, different associates, libraries etc. A book of the Karjaanjoki river basin and the project's results gives a good picture of the project's findings. Leaflets play a less significant part in dissemination activities. Instead of handing out leaflets, the project has focused on updating the Internet site and produced publications.

Dissemination activities, methods and deliverables

Dissemination activities have mostly proceeded according to the project plan. The project included an extremely wide network of associates including specialists on different fields and research and development institutes. This network had a central role in disseminating the information and results. Their personal networks and institutional data networks enable a continuous exchange of information and dissemination of the results both on national and international levels. This has brought a lot of publicity to the project. This was emphasised at the end of the project and this will continue to be effective in the future. The wide network has also been utilised effectively by e.g. publishing the Karjaanjoki LIFE-project's results in their own publication series. Also the Intranet connections of the partners have been utilised and the project's results are available in most of the Internet sites of different partners.

The project's own Internet site has also played an important part in result's dissemination throughout the duration of the project. The project Internet site www.karjaanjokilife.fi introduces the project results, reports and publications. Most of the reports are in pdf-format available for all. The project's Internet site would have required improvement. However, all promised actions did not take place but the Internet site have been used actively for real time dissemination of information. The use of the Internet site has proceeded according to the project's plan and the Internet site will be available for at least 2-3 years of duration. After this majority of the information at the Internet site will be transferred into the websites of the partners.

The tool kits prepared by the project, are essential for disseminating the results and for further implementation of the new methodologies elsewhere. The tool kits form a summary of the findings, methods and produced materials of each sub-project. The contents of the tool kits depend on the sub-project in question. The tool kits will be available as pdf- files on the project Internet site and if necessary, also as paper copies.

Software and databases developed by the project will be available from the partners. These are e.g. WISU- cultivation software, geographic information system of forestry

planning (LUOTSI), mathematical models and databases. All data and databases are available for authorities of municipalities and the government.

The number of seminars organized by the project was decreased and thus the original dissemination plan has changed. The project produced detailed results from different fields of expertise. Therefore the dissemination activities were directed for field of each sub-project, for their experts and institutions. Therefore the project presented the results of different sub-projects in seminars and congresses organized by others. The end result is that the Karjaanjoki LIFE project has been presented more than originally planned. See Seminars and Congresses, page 29 and appendix 14.

Important dissemination methods have been scientific journals and publications, which are published in different publication series of several partners or in other professional magazines. Thus the information has been passed onto the experts of different fields. In addition, the project produced a Karjaanjoki LIFE book, in which the most significant results of the project have been presented. The book has been written in a popular way and the target group of the book is the recreational and other users of the river basin, students and elected officials of the area.

On national scale, the project has been introduced in many occasions to specialists of the field, to teams of other sub-projects, and to other specialists.

The project organised a final seminar 10.3.2005. The seminar was divided into two parts: the most significant results of the project will be presented in the form of lectures and presentations during the day. The seminar continued in the evening and it was aimed at a wider audience. The results of the project were then presented in the form of posters, with audiovisual systems, additional material and with other means of information transfer. The modelling programs and databases were also available for the public. The project leaders and part of the researchers were presenting the main results for the public. The public was able to ask questions related to the project. A briefing aimed at the pupils from a nearby school was held before the final seminar.

Dissemination activities have been taken place also in different education sessions, seminars and meetings. The project has utilized tv, radio and other means of media. The most significant matters have been compiled into a bulletin and given for the media. Also direct contact to the media has been taken by the project.

The Karjaanjoki LIFE project is well known by the public.

The Karjaanjoki LIFE book

The project produced a Karjaanjoki LIFE book, in which the most significant results of the project have been presented. The book has been written in a popular way and the target group of the book is the recreational and other users of the river basin, students and elected officials of the area. The book is 232 pages and bilingual, written both in Finnish and Swedish. A summary of the book will be written in English. The book is attached to the final report (appendix 12).

Publications and manuscripts

The project produced approximately 45 publications and 17 manuscripts that have approximately 2 500 pages text all together. Publications have been published in different publication series of the partners. Those series include the publication series e.g. Uudenmaan ympäristökeskuksen monistesarja, Kala- ja riistahallinnon julkaisuja, Lohjan kaupungin ympäristölautakunnan julkaisusarja. The publications have been distributed widely for research institutes, universities and libraries in the field. The publications have also been distributed directly to the researchers in the field and other associates. The ISBN and/or ISSN numbers in the publications will enhance the availability of them in the worldwide library database or equivalent. The most significant publications will be published at the project's website in a pdf format. A list of publications that already have been published and those, which will be published, can be found at the project's website: www.karjaanjokilife.fi/julkaisut. A few publications will be published later. This is because in some publication series the editing and other related work takes a long time and thus some of the reports have not been published yet.

Scientific publications

Some of the project results will be publiched in scientific journals and magazines of a specific field. A scientific paper of the use of SWAT-model for predicting the nutrient runoff and another paper on incorporating monitoring into remote sensing.

Seminars and Congresses

The project has been presented in 14 international seminars and congresses (see appendix 14) . In these happenings, there have been approximately over 2 000 participants around Europe and the world. The results of the project have also been disseminated in the form of posters and congress publications. Results dissemination has been targeted to the right audience by presenting the project results at specific occasions of the field, related to each sub-project. This has approved to be an effective method.

The project has been presented for experts, students etc. nationally over 20 times, with approximately many hundreds participants.

Presentations and public meetings

The project has been presented during the entire duration in numerous public meetings and other occasions. These have included e.g. training courses, public meetings, work seminars, schools and universities etc. These type of presentations have been held about many ten times and approximately hundreds number of people.

The website of the project www.karjaanjokilife.fi

A website for the project was established at the start of the project: www.karjaanjokilife.fi. The webpages have been updated continuously. The pages have been written in Finnish and also partly in Swedish and in English. The project has given announcements of the happenings, proceeding and results throughout the project duration. The results, methods that have been developed during the project and experiences from developing the methods as well as the final reports of the project will be published at the project's website. All publications, manuscripts and databases are listed at the website. The most significant publications or summaries of the publications will be published in pdf-format at the project's website.

TV, radio and local news papers

The Karjaanjoki LIFE project has been presented on tv, radio and new papers since the beginning of the project. The project has been on 10-15 news papers at least many times. The project has been on national tv a few times and on the radio many times. The media will be utilized also in the future as a means of dissemination.

Leaflets and brochures

Only a few brochures were made during the project. Handouts were made when necessary. The most significant results of the project can be found from the prpoject's website in pdf-format, in Finnish and English (appendix 15).

8. EVALUATION AND CONCLUSIONS

The process

The project proceeded according to the project plan. A planned starting date for the project was 1.4.2001. However, the Commission gave a decision of financing of the project at the end of the summer and therefore the project started in the autumn, i.e. later than originally planned. Although the time lost in the beginning was caught up during the project. However, the lost of one field season (summer 2001) caused some difficulties for the project.

A three month prolongation was applied for the project. The three month prolongation period was thought to be enough. However, reporting and the Karjaanjoki LIFE book took more time than originally planned and the work extended over the summer 2005 (holidays). In addition, the financial report that was delivered for the Commission, took also more time than planned.

Duration of the project was mainly adequate for achieving the goals that were set for the project. The sub-project 3 (Master plan for Mustionjokilaakso) suffered a lack of time and the Master plan was not ratified. However the development of water protective measures, as set in the project plan, were carried out. Decisions of plan ratifications are made by a few municipal councils in Finland and often, because of political interests, the ratification process may take a few years.

Project management

The management of the project was fine, although the project had ambitious aims and the number of participants was great. A management team that formed of financiers and partners supervised the project. The project was divided into seven sub-projects.

1. Ecological restoration of running waters (WP 2.1)
2. Improving the functional value of Lake Lohjanjärvi (WP 2.2)
3. Master plan for Mustionjokilaakso (WP 2.3)
4. Water pollution control methods in agriculture (WP 2.4)
5. Water pollution control methods in forestry (WP 2.5)
6. Planning of sustainable recreational use of the Karjaanjoki river basin (WP 2.6)
7. Development of river basin monitoring systems (WP 2.7)

All sub-projects were connected to each other through cross-activities. The main aims of all sub-projects were similar. Achieving the aims meant clear organisation and targeting efforts to the management activities. The project was well managed and the sub-projects knew what the other sub-projects were doing. Sub-project management teams had experts from different fields as well as other employees for carrying out various practical tasks. Representatives of management team and working groups were able to supervise the project and obtain information on actions taken. This organisation was found effective.

Each sub-project had a sub-project manager who was responsible for the proceeding and budget of the particular sub-project. The sub-project managers reported regularly for the project manager.

Also a management team for sub-project managers was established during the project. This was not in the original plan. This management team was found useful e.g. in carrying out cross-activities, arranging fieldwork and distributing information.

The number of persons working in the project office was underestimated. The project would have required a full time employee carrying out duties in the office. The sub-project managers carried out the office duties, and this caused inconvenience to the project proceedings. The office worker should have also carried out updating of the Internet pages.

Internal information exchange was carried out via email and Internet, which saved time and money. The information exchange was quick and all parties knew the project proceedings at a certain time.

There are also some negative sides in such a wide project. The project had a great number of meetings. These however, have been felt necessary and productive. As the project has proceeded, the number of meetings has decreased and the meeting system has become more effective. The meetings are one step further in creating a network of associates. The information will be concretely passed on during meetings.

The large number of partners was necessary for the fulfilment of the project aims. The strong background gave professional knowledge, various opinions, credibility and publicity. This was felt positive. Especially the participation of municipalities in the area was very important for the project. Several matters related to financing and administration are tied to municipalities. Municipalities will take part also in the future in carrying out plans and therefore it was important to have them participating already during the developmental phase. The municipalities will continue the water rpotection activities initiated by the project, and therefore the municipalities were involved already in the early stage. Without such a large number of participants, the project would not have obtained funding.

During the project several local authorities, experts, employees and financiers were brought together to have meetings. It was considered a good achievement. In these meetings, the atmosphere was good, and when carrying out practical work, the interests of all could be taken into account.

Participation of the locals and organisations of citizens served one of the main aims of the project: activating of citizens for water protection. Volunteers can perform tasks for which the resources of local authorities are not enough. The organisation of voluntary work needs good planning, plenty of guiding as well as simple directions. The project succeeded well in this.

Comparison to the project-objectives

The plans for the project were realistic although the challenges set by the aims were great. The knowledge and methods of different sub-projects could have been utilised

more effective by other sub-projects. A few matters related to cross-activities were prepared too late and those were not used fully by other sub-projects. For example, the results of the sub-project 4 (Water pollution control methods in agriculture) were not utilised by the sub-project 3 (Master plan for Mustionjokilaakso).

Crayfish stocking was not carried out as originally planned. It was planned that crayfish stocking would be done for sites that have been restored by using the local crayfish populations (500 crayfish/site). This was left undone due to lack of suitable crayfish for stocking. Another reason was that signal crayfish populations were located at the restored sites and that species carries crayfish pest. Also the water quality at some sites was not adequate for crayfish.

The application and examining of national typification and classification criteria were accomplished in a smaller scale than originally planned by the sub-project 7 (Development of watercourse monitoring systems). The project also aimed at incorporating the monitoring requirements of the EU Habitats Directive with WFD. This aim was set too high, since the criteria in Finland or elsewhere in Europe were not available at that time yet. Also the monitoring requirements of WFD do not exist yet. The monitoring network has been considered by the project and the monitoring plan will be evaluated in the future and changed according to the new requirements. However, the basic work has been completed.

Transferability of results

The results obtained by different sub-projects were estimated good, partly excellent by the sub-projects. Many of the project's results can be applied to practice and many of the findings are already in use.

The method developed by the sub-project 1 is replicable. The stream surveys developed by the sub-project can be used in other geographical regions. Data sheets for collecting biological information are not applicable as such e.g. in Central Europe but are easily made suitable. Instead gathering hydro-morphological data does not need any adjustments.

Volunteer monitoring, participatory fish stock surveys and remote sensing are replicable according to the methods used and results obtained. Mathematical models are made only for particular water bodies.

Water protective measures related to the sub-project 3 are applicable also elsewhere. Catchment area survey is recommended, since it can be utilised for explaining non-point pollution and conservation and protection of sites of aquatic nature. The methods of participatory plan work can be utilised elsewhere.

The Wisu- software was developed by the sub-project 4. The software makes it possible to make field parcel based records and nutrient balance calculations. The method is already in use in the whole country. Self-monitoring of agriculture is developed further in other national projects.

Improvements for planning of sustainable recreational use of nature are applicable to the already existing planning methods.

The sub-project tested SWAT (Soil and Water Assessment Tool) that can stimulate the nutrient runoff and suspended solids leached per day. SWAT can be utilized in WFD when estimating the nutrient loading caused by forestry practices. Also the soil mapping system can be used in practice after making small adjustments. This is already under progress and the system will be ready to use in the beginning of 2006.

Unified monitoring plan and network of associates is possible to create for other water bodies as well. The monitoring can be improved by coordination and co-operation, without extra costs. This increases the cost effectiveness of monitoring. Functioning of co-operation means good availability of monitoring results, quick reporting and dissemination of results.

Unified monitoring of a water body needs constant development and coordination. The monitoring method is not a finished product, but a model, which should be developed further in order to gain more effective monitoring. This increases the knowledge of water systems and thus improved state of water bodies.

Environmental benefits

Novel methods were developed for management of the state of water bodies as well as for monitoring during the project. Also data of biology, water quality and aspects related to these was collected. All this is available in the future for authorities, research institutes, water protection associations and locals. This information would have never been collected without this project. The final benefit of the project will be seen later in the future as the results are being used in future research and monitoring.

Stream survey method is a useful tool for surveying of the state of stream and their natural state. The method is cost effective and quick and despite of that, it gives accurate and comparable information on the state of running waters. It can also be used as a basic method for surveying sites in which more detailed surveys can be made. For example the method can be used for locating sites for conducting electric fish surveys. The method can also be used for locating valuable sites in terms of natural state.

Volunteer monitoring and participatory monitoring as well as management and restoration activities accomplished by local volunteers with a minor guidance etc. is highly cost effective. Volunteers are important for a wider management projects. Especially municipalities are interested in volunteers in projects that they are funding. Therefore volunteers have a significant importance when financial decisions for management projects are made.

The methods and models developed by the project aim at decreasing loading to water bodies or they give more and detail information on the state of a water body. The use of models in planning and practical work of projects enable making of more careful estimates of the impacts that are targeted towards water systems. Both can be also used for cost effective estimates of measures.

Direct/local environmental benefits

The project gathered a great amount of information that can be directly used by authorities. These include water quality measures, biological information, pollution data, and information of human impact on waters, dams, weirs and other obstacles in streams

and rivers and nature travel services. These information has been compiled into different data bases which can be utilised later in future projects and surveys.

22 sites were restored by the sub- project 1. There are over 100 dams and weirs located in the stream network, and in addition to, several channelised rapids. The obstacles were removed by various means, e.g. removing of a dam or other obstacle, by chancing its structure or by building a fish passage.

Nutrient balance calculations were performed y the sub-project 4 for 33 farms, for over 800 field parcels altogether.

The sub-project 6 developed sustainable nature travel and the use of recreational areas by carrying out the use of a recreational area by using the planning of sustainable recreational use- method. By using the same method, two resting sites were built in the shore areas of the Lake Lohjanjärvi and Lake Hiidenvesi.

Innovative aspects of the project on national and international level

(See appendixes 2-12) for more detailed descriptions of the most significant innovations accomplished by the project).

A novel factor for stream surveys was the area that it was covered (entire river basin) and the way in which the hydro morphological and biological data was combined.

A database was created for analysis and gathering of the volunteer monitoring results. This is available nationwide via the Internet. The results from volunteer monitoring were used both in remote sensing and mathematical modeling. Participatory fish stock surveys tested the Nordic- fish net in a large water body.

Water protective measures, methods and plan regulations suitable for planning were developed. The usability of water models for different land use options was investigated.

Novel nutrient balance calculations for cultivation planning were carried out. The development of agricultural self-monitoring system for farms was initiated.

The international SWAT-model was used for the first time in forestry and parameters were developed for estimating forestry induced loading. A soil survey method developed for forestry can be treated as a nationally innovative method development.

Planning of sustainable recreational use of nature- VirSu was developed by the project. Nature and recreational values, number of visits and the environmental influence of them can be identified easier by using the method.
Sub-project 7 produced information for the application of WFD for national needs. Examples of typification and classification of surface waters were done according to the requirements by the WFD. The possibilities for incorporating the monitoring requirements of the EU Habitats Directive with WFD were evaluated. Also the possibilities to incorporate official and mandatory monitoring in a new way was considered.

Dissemination and deliverables

The dissemination activities have been more efficient than expected. This has mainly been due to the great number of partners. The project has utilized the dissemination

methods of different partners. Therefore dissemination activities have been targeted directly to those needing the information.

Several networks of associates have been utilized during the dissemination process. Direct contacts with the experts have found to be effective. The project participated in international conferences and seminars etc. more often than originally planned. The project has obtained invitations for presenting the findings and methods from abroad. Dissemination activities will continue.

Job creation potential

The impact of novel and innovative methods developed by the project is difficult to estimate. The project has employed people for 36 years in total. The project has also had 2 students doing their Masters thesis or equivalent for it and thus the project has furthered their employment through education. The project has also employed indirectly e.g. by developing the nature travel in the area and thus influenced the success of local entrepreneurs. This creates jobs.

Relevance to the EU legislative framework

Some of the methods developed by the project are suitable for the application of the WFD. The typification and classification of surface waters was improved, biological monitoring was improved etc. Stream survey method, fish stock surveys, volunteer monitoring and models can be used for monitoring and estimating the state of surface waters and pollution. For more details see appendixes 2-12.

9. FINANCIAL REPORT, COMMENTS

Sum of the incurred costs is 2 512 633,78 €, which is 9,3 % higher than originally planned.

The contribution of a few partners will be 30 % less than originally planned. The reasons for the decreased contribution of these partners has been explained in the Interim and Progress reports. Other partners have accomplished some work that has originally been planned for other partners. These changes were needed in order to accomplish the work easily. We want to emphasize that all actions planned have been accomplished. We would like you to notify that in regarding to the total budget, these changes are minor.

PROJECT COSTS OCCURRED

	Cost category	Total cost according to the Commission's decision	Costs occurred from the start date to the final date 30.06.2005	%
1	Personnel	1 485 726	1 546 934,17	4,1 %
2	Travel	104 219	89 497,42	-14,1 %
3	Outside assistance	540 624	130 865,89	24,2 %
4	Durables: total non-depreciated cost	72 199	56 918,02	-20,7 %
	Infrastructure sub-tot.	0	0	0 %
	Equipment sub-tot.	10 091	4 487,94	-52,0 %
	Prototypes sub-tot.	62 108	52 430,08	-15,6 %
5	Consumables	80 071	112 933,75	41,0 %
6	Other costs	13 639	33 574,85	146,2 %
7	Overheads	1 705	925,69	-45,7 %
	SUM TOTAL	**2 298 183**	**2 512 633,78**	**9,3 %**

10. APPENDICES

Appendix 1. Organisation
Appendix 2. Stream survey as a method for species conservation (WP 2.1)
Appendix 3. Volunteer monitoring of water quality and fish by local stakeholders in the Lake Lohjanjärvi management project (WP 2.2)
Appendix 4. Fish community evaluation and feasibility assessment of biomanipulation of Lake Lohjanjärvi by volunteer aided multimesh gillnet survey (WP 2.2)
Appendix 5. Satellite remote sensing of Lake Lohjanjärvi water quality (WP 2.2)
Appendix 6. Integrated river catchment management - a network for optimized water management, rehabilitation and protection of aquatic ecosystems in Lake Lohjanjärvi catchment area. Three dimensional (3D) modelling of Lake Lohjanjärvi (WP 2.2)
Appendix 7. Master plan as a tool in water protection (WP 2.3)
Appendix 8. Decreasing nutrient runoff by means of effective cultivation (WP 2.4)
Appendix 9. Water pollution control methods in forestry (WP 2.5)
Appendix 10. Planning of sustainable recreational use of nature (WP 2.6)
Appendix 11. Development of co-operation network in watercourse monitoring systems in the Karjaanjoki River basin (WP 2.7)
Appendix 12. The Karjaanjoki LIFE book. 232 pp.
Appendix 13. A detailed list of the dissemination products of the KarjaanjokiLIFE project
Appendix 14 Seminars and conferences
Appendix 15 Karjaanjoki LIFE 2001-2005 - Exploring new dimensions in water protection
Appendix 16 CD ROMS (final report, finance report, the Laymans reports, after LIFE and long-term benefits)
Appendix 17 Auditors' report