



Best LIFE Environment projects 2011



LIFE Environment

Environment



EUROPEAN COMMISSION ENVIRONMENT DIRECTORATE-GENERAL

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Foreword

This is the eighth time that the LIFE Environment Awards have taken place, this year rewarding the most outstanding LIFE projects that were completed by the end of 2011. The aim of the awards is to shine a light on the most notable of the many worthwhile projects co-funded by the LIFE programme: those that provide a blueprint for others of what well-designed, well-executed, innovative and inclusive projects should look like..

With the valuable input of my fellow National Focal Points from the other Member States, this year for the first time I was responsible for coordinating the process of picking the winners, which followed the by now well-established selection procedure (see page 2). The selection team consisted of 21 evaluators from 15 Member States. The two "Best of the Best" projects selected focused on innovations in construction and eco-friendly power generation respectively; the three "Best" projects targeted agricultural and textile industry waste, as well as a project to recultivate two urban lakes in a Polish city.

I was very proud and pleased to see the latter being recognised, as it is the first project from my country to receive a "Best" LIFE Environment project award. It has also been very pleasing to see the importance of the LIFE programme being widely recognised and celebrated in this, its 20th anniversary year. The LIFE Awards are a continuing demonstration of the value and value-for-money of this carefully targeted funding stream. It proves that LIFE continues to support meaningful projects whose efforts and impact resonate long into the future.



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The “Best of” initiative

The LIFE Best Environment Awards 2011 highlight the demonstration value of the LIFE programme and the importance of replicable project results.

The objective of the LIFE Environment Awards programme is to help improve the transmission of project results by using a set of criteria to identify those projects with the highest potential for long-term environmental improvement. Thus, for the last eight years, EU Member States represented on the LIFE Committee and the European Commission's LIFE Unit have acknowledged those projects that are just a little bit more outstanding than the rest by awarding them “Best of the Best” and “Best” project status (see box “How the winners were chosen” for an explanation of the selection procedure). The latest round of awards - for projects completed by the end of 2011 - saw five projects singled out for special attention.

Both “Best of the Best” projects came from Germany – ‘INSU-SHELL’ (see pp. 5-7) and ‘Moveable HEPP’ (pp. 8-10). In addition, three projects received “Best” project awards: ‘ES-WAMAR’ from Spain (pp. 12-14), ‘BATinLoko’ from Portugal (pp. 15-17) and the Polish project ‘Lake recultivation in Gniezno’ (pp. 18-20).

Representatives of the five projects were presented with their awards in Brussels by the Director General of DG Environment, Karl Falkenberg, in a ceremony on 24 May, 2012 at

the annual high profile international gathering, Green Week. Mr Falkenberg praised the award winners for their ability to implement actions that resulted in quality outputs and that held good demonstration value for replication elsewhere. He also took the opportunity to praise those who set up the LIFE programme 20 years ago, saying that they had a “good understanding of the demonstration potential” of the instrument.

“Best of the Best”

Thomas Gries received the “Best of the Best” award on behalf of the entire ‘INSU-Shell’ team, who had worked together to validate a new construction technique that uses fibre to replace steel for reinforcing concrete. Mr Gries noted the project used LIFE co-finance to show that, “Our technology can significantly reduce the amount of concrete and steel that is needed in construction. We knew that companies in the trade would need convincing about this new approach so we constructed a commercial-scale building using [our] system. We have a saying that ‘only seeing is believing’ and our approach meant we could take this environmental technology to the market.” Collecting the award for ‘Moveable HEPP’, Georg Schmid told



Photo: Justin Toland

The winners of awards for the Best LIFE Environment Projects 2011

the audience in Brussels that LIFE funding had helped the project partnership to, "Test and demonstrate an innovative hydropower plant which overcomes environmental challenges faced by previous equivalent technologies...LIFE's support resulted in us finding a new way of keeping hydro plants green."

"Best" practices

Collecting the award presented to his city in person, the Mayor of Gniezno, Jacek Kowalski, spoke eloquently of the valuable impact LIFE funding has had. The project - 'Lake recultivation in Gniezno' has dramatically improved the ecological status of two urban lakes, "However cleaner lakes and ordered shores are not the only effect of this extraordinary programme," said the mayor. "Notwithstanding the fact that a lot of work and effort went into its execution, it gave our town something much more important: it reminded us that care for the natural environment, especially for lakes, gives a new splendour to the whole agglomeration."

The 'ES-WAMAR' project trialled a range of innovative approaches to the management of pig waste in Aragon. "150 pig farmers and 450 land farmers have participated in this project, allowing the management of more than 800 000 m³ of pig slurry. This model is now being transferred to other areas with similar problems," explained project manager, Arturo Daudén.

In neighbouring Portugal, the 'BATinLoko' project developed a tool that simplifies the process of applying 'Best Available

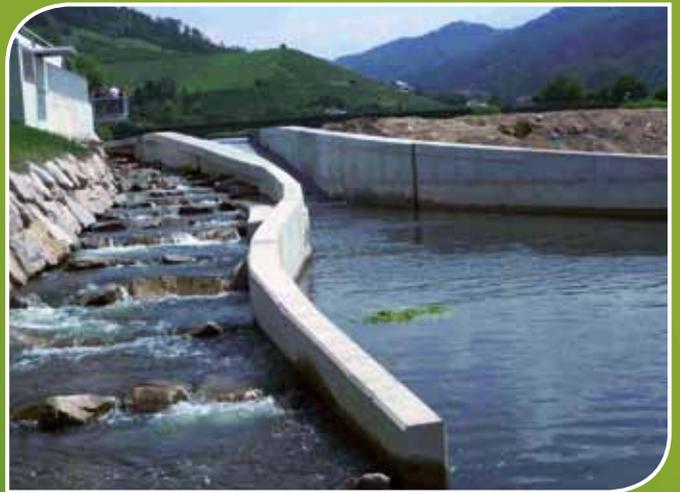
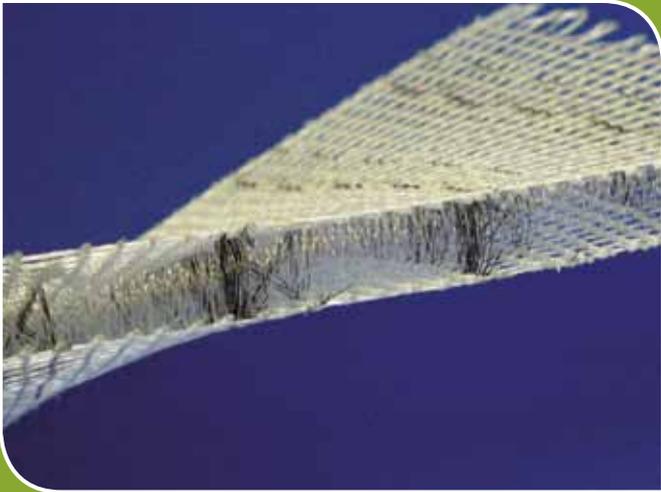
How the winners were chosen

Scoring of completed LIFE Environment projects was launched in the summer of 2004, judging them against a set of 'best practice' criteria developed by the Commission in cooperation with the Member States. These included: projects' contribution to immediate and long-term environmental, economic and social improvements; their degree of innovation and transferability; their relevance to policy; and their cost-effectiveness. In view of the importance of these criteria to the success of a project, beneficiaries are also required to provide an 'After-LIFE Communication Plan' and an analysis of the long-term benefits of the project with their final report. This information forms an integral part of the evaluation process.

The selection of this year's winners followed the established procedure, whereby projects were initially technically assessed by the LIFE Unit's external monitoring team, provided by the Astrale consortium. The monitors ranked all the projects that ended by December 2011 to produce a first list. Using the agreed criteria, the final selection was undertaken by the Member States under the coordination of Andrzej Muter (from the Nature Protection Department of the Polish National Fund for Environmental Protection and Water Management).

Techniques' (BATs) in the textiles industry. Dr Xavier Gonçalo from the project told the audience in Brussels that 'BATinLoko' was "Innovative in the way it defined environmental performance indicators associated with the textiles sector. With these indicators we expect it will be more feasible to monitor companies' performance and gains with respect to the environment."





BEST OF THE BEST PROJECTS

Germany: Reinforcing concrete through the power of textiles

The LIFE 'INSU-SHELL' project demonstrated the feasibility of using a high-tech, thermally insulated textile reinforced concrete (TRC), which minimises the amount of concrete necessary in the construction of the facades of buildings. TRC offers, amongst other advantages, considerable energy and greenhouse gas emission reductions.

Concrete, the main building material used in civil engineering construction, uses large amounts of cement, the production of which, it is estimated, contributes 5% of the man-made annual CO₂ emissions worldwide. The LIFE 'INSU-SHELL' project aimed to tackle this environmental problem by developing a TRC technology.

Textile reinforced concrete is a new composite material made of fine grained, high-strength concrete and a reinforcement of technical textiles. The textiles are highly effective at absorbing tensile forces. They increase the load-bearing capacity of components, similar to a steel reinforcement in reinforced concrete.

Researchers at the Institut für Textiltechnik (ITA) in Aachen, Germany set out to show that this new system would enable the construction of thinner-walled building facades offering a superior performance than comparable materials made out of GRC (glass fibre reinforced concrete).

This superior performance was demonstrated at the institute itself in the construction of a TRC concrete façade of just 15 mm (conventional steel reinforced concrete facades require a minimum thickness of 70 mm). The textiles used – glass or carbon fibres – are not susceptible to corrosion, and it is thus



The project saved approximately 420 tonnes of CO₂ compared with a conventional reinforced concrete building



possible to use textile reinforcements close to the surface of a component. As a result, large amounts of unnecessary concrete can be eliminated and building elements made thinner. "With most concrete you have more material than you need, but with textiles you can really design it according to the load," says Silke Tomoscheit of ITA.

The smoother finish of the concrete is an added aesthetic benefit of the material, and one that had a practical advantage, too, she adds. The even surface of the concrete blocks allows them to be moved by vacuum grippers, which makes the process of attaching them easier. In addition, the façade elements and windows can form a single pane.

Environmental savings

LIFE funding gave a major boost to the development of the TRC technology. It allowed the beneficiary to demonstrate the technology on a full-scale – i.e. the construction of a facade of the (INNOTEX) textile research centre at RWTH Aachen University. Several research centres at this university have been collaborating of the development of TRC since 1999, and their experiences (including work on the Café Reiff) laid down the foundation for the goals of the project.

The system was developed according to the architectural and physical requirements of the new building. The facade

Glass or carbon fibres were used to make the textiles



Photo: Thomas Mayer

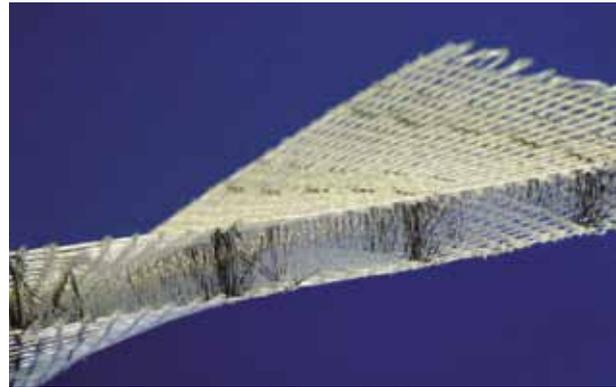


Photo: Thomas Mayer

The textiles used are not susceptible to corrosion, thus it is possible to use textile reinforcements close to the surface of a component

of this building extends to 590 m² and uses a total of 216 INSU-SHELL elements, making it the first implementation of the new technology textile concrete on an industrial scale. With a total concrete area of some 1 200 m², the construction project saves approximately 420 tonnes of CO₂ compared with a conventional reinforced concrete (relating to a saving of 70% of concrete used). "The ecological advantages are mostly related to the material savings," explains Ms Tomoscheit.

Other improvements in environmental performance include:

- An estimated 55% decrease in global warming potential – savings of CO₂ equivalents are some 80 kg/m², while the reduced weight (by 83%) of the elements reduces transport emissions.
- A reduction of nearly 45% of the energy footprint for the facade system – 1 026 MJ/m² as opposed to 1 823 MJ/m² with a conventional façade.

According to the beneficiary, production and delivery consumes around 54% of the non-renewable energy needed for conventional concrete. TRC concrete also potentially allows for improved energy efficiency through its improved insulation. "We hope to have a follow-up project that will analyse the whole lifecycle," affirms Ms Tomoscheit.

Steady progress

The first phase of the project entailed the setting up of a coordination team and the finding of industry partners. During the second phase, the technical details and planning of the facade system was established, taking into account the architectural requirements and based on evaluations of existing concrete facades. In the spring of 2008, prototypes were produced as part of phase three, along with the obtaining of a building permit.

Phase four, the actual production of the facade panels, was then ready to begin in May of that year. Meanwhile, phase five, the building of the project model facades at the Tech-



The basic element of construction is made of two shells of textile reinforced concrete combined with rigid polyurethane foam insulation

Textil in Frankfurt and at Innotex, had begun in 2007 ahead of the installation proper. In June 2009, the completed building was made available to the ITA, and in the sixth phase, an ecological and economic assessment of the new facade system was carried out.

These assessments clearly showed that although production costs are higher with TRC than with conventional concrete, there are economic benefits associated with the new system. For instance, the reduced weight of the elements saves around one-third of transportation costs. It is also expected to significantly lower the costs in further applications.

High initial production costs are the result of the increased manual labour involved. INSU-SHELL's production schedule began earlier than anticipated, thanks to the availability of government funding, and an early kick-off placed greater strains on human resources, which led to higher production costs - estimated at around €450/m². In order to be competitive, the beneficiary says these costs would need to fall below €300/m².

A second TRC building is currently being constructed at the ITA site, although with a smaller footprint than initially envisaged, owing to reduced funding. Costs for this remain a little over the target threshold, says Ms Tomoscheit, but "improvements will come - €300/m² is definitely feasible." And once economic breakthroughs have been achieved, job creation is a very real potential outcome of the project.

Establishing a market

The next step for textile reinforced concrete is to widen knowledge of its benefits and create an economic situation in which TRC is a viable solution - although the beneficiary cautions that it is not the best type of concrete for every construction. "We are overrun by people who are interested in the project, and several companies want to get involved in this field of technology because our project is so well known," says Ms Tomoscheit. However, the lack of standards is a major stumbling block to further use of the material.

"Companies are looking into it, but the cost of getting approval is problematic," admits Ms Tomoscheit. She advocates the introduction of an environmental product label on an EU level.

Another barrier to the development of a sustainable market for TRC is the amount of advertising that needs to be done, but there are reasons for optimism. To meet existing legislation, some 80% of buildings need to be retrofitted and TRC offers significant advantages over other materials - namely, using TRC doesn't entail any major restructuring of the building and because it requires less material, less overall room space is lost.

The impressive results of the LIFE project should also stimulate development in this area. Studies of the constructed facade have demonstrated its good load-deformation, high durability and sustainability. The developed self-supporting sandwich panels were also shown to be very effective. With improved production processes that are able to achieve consistent homogeneous composite joints and with the development of continuous composite means for reducing the shear deformations and the shear force components in the insulating core, it will be possible in the future to create much larger spans. Textile reinforced concrete is a flexible solution for architects and planners.

Project number: LIFE06 ENV/D/000471

Title: INSU-SHELL- Environmentally Friendly Facade Elements made of thermal insulated Textile Reinforced Concrete

Beneficiary: Rheinisch-Westfaelische Technische Hochschule Aachen (RWTH Aachen)

Contact: Thomas Gries

Email: ita@ita.rwth-aachen.de

Website: <http://www.life-insushell.de>

Period: 01-Oct-2006 to 31-Mar-2010

Total budget: €2 193 000

LIFE contribution: €900 000



Germany: hydropower on the move

The 'Moveable HEPP' project demonstrated the economic feasibility and environmental desirability of a moveable hydroelectric power plant. Pilot actions were carried out in existing weirs in Baden Württemberg, Germany, and results have shown the clear benefits in terms of both fish protection and energy production.

Though hydroelectric power accounts for 10% of total EU electrical power production, it is not without its environmental problems. Large dams can radically alter the hydromorphology of a river system, adversely affecting fish populations. A high number of smaller hydropower weirs also operate in European rivers. These weirs, which were constructed to prevent erosion and typically have a low turbine head, have a major drawback: energy output is not economical and fish are unable to pass through the constructions. As a direct result, fish numbers and biodiversity have declined in European rivers.

source of renewable energy without adversely hindering the natural ecosystem functions of river habitats.

The new system, known as 'Moveable HEPP', was demonstrated on a full scale on the river Kinzig, one of the most important rivers for the reintroduction of the salmon in the Upper-Rhine region. For this reason, the beneficiary, the electric utility company, Elektrizitätswerk Mittelbaden Wasserkraft, says that it was "necessary to consider a significant ecological enhancement of the river as a main objective beside the realisation of a modern, highly efficient and low-maintenance systems engineering."

The LIFE 'Moveable HEPP' project showed that a new hydropower technology can operate effectively as a

This aim was achieved by integrating movable hydropower plants into existing weirs at Gengenbach and Offenburg: the funnel-shaped main body of these hydropower plants houses



The two new 'Moveable HEPP' hydropower plants are capable of producing some 4 650 MWh/yr of energy



Photo: Jon Eldridge

the turbine and the generator and can move up and down adjusting to the load of water the river carries. Lifting the hydropower body at times of higher water not only increases the electricity yield, it also allows part of the water and with it the bedload (gravel) to flow beneath the hydropower body. Also fish can pass under, over and even through it (constantly slow rotation). The two plants are capable of producing some 4 650 MWh/yr of energy.

Innovative technology

The new system was developed by research projects and at the test facilities of the foundation Deutschen Bundesumweltstiftung (DBU) in Osnabrück and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety in Berlin.

The eco-friendly nature of this system's engineering, which can be realised on many similar locations in Europe and worldwide, persuaded the Ministry of the Environment of the Federal State of Baden-Württemberg in Stuttgart to support the application for European Commission co-funding of a demonstration plant.

The LIFE project established demonstration plants consisting of both the complete turbine and generator at two sites. One of the chief advantages of the technology is that it offers the electricity company the ability to control remotely the angle of the turbine according to fluctuations in the river flow – its components are moveable and are able to work at different heights.

"We are able to adjust the machine when the level of the water varies," explains project manager, Georg Schmid. "A great benefit was to be able to control the water level during heavy rainfalls and to stop it going over the banks."

As stated, one of the benefits of the system is that it allows water to pass over and under the HEPP equipment. "The main aspect is the ability to handle these fluctuations in order to avoid catastrophes," adds Mr Schmid. A cleaning system prevents debris from building up on the weir and adding to the risk of flooding. Tree parts and other floating matter are levered over the system by a rake-like instrument that is activated by increases in pressure – i.e. when the system senses a specified weight of debris, the rake is moved up to release the material beyond the weir and farther downstream.

In fact, the lack of costs for compensatory measures for managing flood risks or the transfer of river bed matter is one of the main economic benefits of the system. Moreover, HEPP's competitiveness is further boosted by its high efficiency: a frequency converter is not needed and the use of a permanent magnet for the stator saves the power for electric magnetisation. The design also achieves an increase in efficiency and a reduction of operating costs by coupling the turbine and per-

manent magnet-excited synchronous generator on one single shaft. The system was even shown to be able to operate in winter when the temperature fell to -15°C.

The project calculated that HEPP's greater efficiency could lead to savings of 16% in comparison with a conventional plant, plus 11% higher returns (electricity sales). Combining these factors led the HEPP team to estimate that its technology could increase the ratio of 'raw profit per investment sum' by more than 40% (from 5.18% to 7.36%).

Another economic benefit that Mr Schmid highlights is the shortened construction time. "The system is delivered in two pieces and both can be constructed in parallel," he says.

Fish protection

Environmental regulations state that fish must be able to safely pass through the plant. Conventional hydropower plants, however, can only comply with these regulations by constructing additional expensive structures. With the new system, fish are free to pass above and below the turbine.

Monitoring confirmed the passage of the fish. "It took a few moments, but then suddenly one went over the system and then the others followed. It was funny to see," says Anthea Goetz of the E-Werk Mittelbaden.

The Kinzig is a tributary of the Rhine and a major spawning ground for salmon. River bed matter that is important for successful spawning – such as gravel – is not affected by the HEPP system. At both sites an additional fish ladder was

The Gengenbach and Offenburg weirs are attractive spots with walking and cycling routes



Photo: Jan Eilfridge



With the hydropower plant fish are free to pass above and below the turbine and various fish species have migrated through the river Kinzig to reach their former spawning grounds

erected; at Offenburg it was necessary to extend this by three steps because of the depth of the water.

Use of the demonstration system reduced the amount of water that is diverted into the canal at Gengenbach from some 5 m³/s to 0.5 m³/s, meaning that more water remains in the Kinzig. The project team believes that the right to a minimum amount of water diverted into the canal at Offenburg of 7 m³/s will help in the implementation of the EU Water Framework Directive and the ecological condition of the Kinzig will be improved here too. The hydropower plants in Gengenbach and Offenburg supply some 800 and 550 average households with energy respectively.

Making waves

It was important for the project team to take into consideration the feelings of the local population. The system, which weighs 130 tonnes, is mostly submerged, and as a result, is fairly quiet. "A lot of people are pleasantly surprised," says Mr Schmid.

Indeed, many people are asking to visit, and approximately 90 groups have been welcomed at the two sites since July 2010 (the project officially ended in June 2011). Interest from locals resulted in the building of short viewing promenades at Gengenbach and Offenburg, and the weirs are attractive spots with adjacent walking and cycling routes.

International interest has also been generated. A team from Switzerland, which is installing a system of 16 turbines on the river Salzach, visited the project. "We are a good example of how it can work. The next step is to align these systems one after another in the same river," explains Mr Schmid.

Interest in the commercial sector was stimulated via the project website, which enables interested parties to see how the technology works in practice via live webcams embedded in working versions of the HEPP technology.

In addition to its LIFE Environment Awards success, the project has received two prizes in Germany: the 'NEO2010 - Innovationspreis der TechnologieRegion Karlsruhe' and the 'Umwelttechnikpreis Baden-Württemberg', an environmental award for outstanding and innovative products in environmental technology: it won first prize in the energy efficiency category in July 2011.

After an invitation from former President Horst Köhler, the system was introduced to the general public during the German trade fair 'Woche der Umwelt' in 2007 at the Bellevue Palace in Berlin. It was also featured in the science TV programme, 'Nano', in September 2008.

Project number: LIFE06 ENV/D/000485

Title: Moveable HEPP - Demonstration Plant in the Kinzig River: Moveable Hydroelectric Power Plant for Ecological River Improvements and Fish Migration Reestablishment

Beneficiary: Elektrizitätswerk Mittelbaden Wasserkraft GmbH & Co. KG

Contact: Georg Schmid

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schmid.georg@e-werk-mittelbaden.de

Website: <http://www.moveable-hepp.com>

Period: 01-Oct-2006 to 30-Jun-2011

Total budget: €6 619 000

LIFE contribution: €1 695 000





BEST PROJECTS

Spain: Greener solutions for managing pig slurry

Located in Aragon (north-eastern Spain) the 'ES-WAMAR' project successfully demonstrated the effectiveness and environmental, social and economic benefits of using local integrated systems – based on best available technologies – for the management of large quantities of pig slurry.

The autonomous region of Aragon, Spain, is Europe's third largest pig farming area, being responsible for the rearing of almost 10 million pigs each year. Pig farming and related activities thus have important economic and social implications for the region. However, the activities also generate large volumes of slurry – an estimated 13.5 million m³/yr – and are responsible for pollutant emissions from non-point sources to surface water, ground water and air. Another problem is that in some areas there is a high concentration of farms and the land in these areas cannot cope with the amounts of slurry generated. Moreover, land types vary considerably across the region; so that issues connected with the management of slurry also need to take this and the socio-economic conditions into account.

This complex situation called for a comprehensive solution to the environmental and social problems caused by pig slurry and emphasised the need to reduce waste in all sectors and to enhance re-use and recycling opportunities.

LIFE co-funding was secured for a project that aimed to improve management of the slurry by introducing an integrated model for its processing and distribution. It sought to match

the needs of arable farmers for fertiliser with the need of the region's pig farmers to dispose of their slurry appropriately and economically, through collective action.

Specific objectives were to reduce soil, water and air contamination – especially nitrates from non-point sources – in areas around the farms; and maximise nutrient recycling through the valorisation of the slurry as manure on arable land. The model also aimed to improve economic efficiency and minimise the energy requirements of the waste management. There was also a social dimension to the project, as many local communities were experiencing problems associated with the unpleasant smell associated with the incorrect handling of the slurry. This generated complaints from people locally and furthermore limited the possibilities for the future development of some areas for tourism.

'ES-WAMAR' was coordinated by SODEMASA, the environmental development society of Aragon, with co-financing from the regional government. "We needed to find a solution that could be adapted for different land-types and that could also be replicated in other EU countries with areas of intensive livestock production," explains project manager, Arturo Daudén of SODEMASA.

The 'ES-WAMAR' project applied different manure management models based on BAT (Best Available Techniques), adapted to the local socio-economic and environmental circumstances





Photo: Gabriella Camarasa

Storing slurry in tanks enables the fertiliser to be used at the right time of the year and avoids the losses of nutrients and subsequent pollution

Three sites in Aragon were selected - in Tauste, Maestrazgo and Peñarroya de Tastavins. They share the same environmental problem (i.e. the production of high volumes of pig slurry). However, the management solutions needed to be capable of working effectively for the different locations.

The first task (before the project started) was to carry out a study of the sites – defining the boundaries, examining the pig farms, and also looking at the arable farms to assess their requirements, if any, for the reuse of the slurry as manure. The project partners then established a separate Swine Waste Management Enterprise (SWME) for each of the three sites, with the aim of providing local solutions within centralised management structures – two of the SWMEs are privately-owned, with that of Peñarroya belonging to the public administration. The enterprises brought together interested farmers into a collective, formalised through specific contracts. Each SWME was responsible for planning, organising and implementing manure collection, treatment (where needed), distribution and field application, with technical assistance provided by the French institute, Cemagref (now IRSTEA).

“We wanted to prioritise valorisation of the pig slurry by recycling it and re-using it directly,” recalls project deputy manager, Marta Teresa Fernández. A key problem, however, was how to organise the different farmers, and also how to make the crop farmers better aware of the potential of the slurry as a fertiliser: “They (the farmers) thought that the mineral fertiliser they buy is better,” explains Mr Daudén. To overcome these initial reservations, the project team organised numerous seminars to involve and inform the farmers and importantly, to demonstrate the benefits of using this type of manure.

Localised solutions

Each of the three SWMEs pursued its own approach to manure management. In Tauste, which has a large number of pig farms, but also sufficient availability of arable land to make use of the slurry in situ as organic fertiliser, the enterprise had at its disposal three storage tanks with a total capacity of 28 000 m³ and units (tractor plus applicator) for spreading slurry on fields using the GEMA tool developed by the project (see box).

GEMA

GEMA links databases of relevant information about each farm in the SWME (including the amount of slurry provided and applied, administrative requirements and invoices) with Geographic Information Systems (GIS) maps and GPS data. Its aim is to help the SWME choose the best options for manure management, taking into account agronomic, economic and environmental criteria, according to the regulatory framework.

Nowadays, as word has spread about the effectiveness of the slurry, the land farmers contact the SWME directly. The slurry's nutrient content (especially its nitrogen (N) content) is analysed to determine the correct dose to apply on the field. Each tractor has an integrated flow system and an on-board computer. “This information (of the dosage) is fed into the computer on the tractor so that the dose is applied correctly and uniformly regardless of the speed of the tractor,” says Alfonso Gracia Pueyo, agrarian technician with the Tauste SWME. The correct dosage is important to avoid contaminating the soil with excess P, N and heavy metals. As well as avoiding excess nitrate leaching in surrounding water bodies, the system also drastically reduces emissions of ammonia and greenhouse gases, whilst guaranteeing the same crop yields.

Maestrazgo County is a mountainous area whose pig farms are concentrated in different places to those where the slurry is used. The SWME is able to match an excess of slurry in one area with a demand for slurry for fertiliser from crop-land farmers in another and arrange for the pig manure to be collected and transported to where it is needed. To this end, it has built eight storage tanks and two gravity pipelines to transport the slurry, reducing operating costs (and associated pollution), as well as improving access to remote arable land. The high initial cost of the pipelines can be amortised within 8-13 years.

Two innovative gravity pipeline systems were constructed in Maestrazgo to transport the slurry to the storage tanks



Photo: Gabriella Camarasa



Peñarroya has a slurry surplus (i.e. not enough arable farms to use it on fields). To solve this challenge, the collected slurry is transported to a treatment plant by lorry or pipeline (there are now 13 farms connected to the plant via pipeline). The treatment plant uses a centrifuge to ensure a physical-chemical separation of slurry solids; this is followed by biological nitrification/denitrification (N/DN) treatment. The treated liquid effluent obtained from this process is used on 120 ha of farmland, whilst the solid fraction, with its high organic matter and phosphorus content, is used as an organic fertiliser outside the county. Since the project ended, a biogas production plant has been coupled to the treatment plant to make it energy independent and help further valorise the pig waste.

In each of the three areas, management approaches were supported by the use of BATs (best available technologies) for slurry management and included an innovative software tool, GEMA, specially developed by the project to support and optimise this task.

A positive and replicable impact

The project was able to steadily increase the quantity of slurry it managed, reaching a total of 800 000 m³ of managed manure by the time it finished. This included some 100 000 m³ of slurry treated in the Peñarroya plant.

The collective management approach was found to enable cost-sharing, improved energy efficiency and higher control of field application, as well as ensuring support and engagement with the overall environmental aims of improved waste management. This was further supported by information and training events for technicians and farmers and the creation of 16 permanent jobs, at the centres of the three SWMEs. The value of the pig manure as organic fertiliser was also demonstrated and has been widely accepted by farmers. Indeed, surveys carried out in the three sites at the end of the project found that 70% of farmers polled said they are more

Schema of the treatment plant in Peñarroya de Tastavins, which treated 100 000 m³ of slurry



Trailing hose system for slurry application

aware of environmental issues and more engaged with correct slurry management since they joined their SWME.

Reflecting on the success of the project, Mr Daudén believes that one of 'ES-WAMAR's important achievements was the creation of the SWMEs, as there was clearly a need for a management structure that brought together all the parties concerned and that could manage logistics, requests, administrative burdens and data and environmental monitoring and correct application.

Another success, according to the project manager, is that this was a large-scale demonstration project whose manure management models can now be directly transferred to other areas: "There was a common problem; and we produced an integrated management system that took account of the different scenarios, brought together people/stakeholders and also created jobs." He says that the aim is to try to extend the project work to other areas in future. Indeed, four treatment plants are now being built in Aragon to reduce diffuse pollution and improve water quality.

Project number: LIFE06 ENV/E/000044

Title: Environmentally-friendly management of swine waste based on innovative technology: a demonstration project set in Aragon (Spain)

Beneficiary: SODEMASA (*Sociedad de Desarrollo Medio ambiental de Aragón*) – The name of the organisation was changed to SARGA (*Sociedad Aragonesa de Gestión Agroambiental*) after the completion of the LIFE project

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Period: 01-Oct-2006 to 31-Mar-2011

Total budget: €6 900 000

LIFE contribution: €2 564 000



Portugal: Developing best available tools for textiles

The 'BATinLOKO' project has developed a user-friendly online tool that supports textile companies in making the most efficient choices for improving their environmental performance.

The Portuguese Textiles Association (ATP) has over 700 member companies making textiles and clothing in Portugal, many of them located around the municipality of Vila Nova de Famalicão, just outside Porto. The 'BATinLoko' project originated "as a challenge from the Portuguese Environment Agency [APA] to improve implementation of Best Available Techniques [BATs] amongst our membership," recalls Paulo Vaz, CEO of the ATP. All the association's members had already implemented BATs, but some to a lesser extent than others.

The main challenge was that most companies lacked data on the economic and environmental benefits of implementing BATs. Without these 'environmental performance indicators' it was hard to make decisions on investing in new techniques. "Companies are not very interested in theory and philosophy," highlights Mr Vaz. "They have to be focused on the practical things that will have a direct impact on their business."

ATP turned to CITEVE - the Technological Centre for the Portuguese Textile and Clothing Industry - a resource that it had established to develop applied research for the textile industry. ATP asked CITEVE to create a tool that would provide the environmental performance indicators necessary to allow companies to easily understand which BATs they should implement in their specific business and why.

CITEVE already had experience with the LIFE programme dating back to 1994, having been involved with four projects. One project had looked at the recovery of textile bonding products; another, a membrane-based bioreactor for textile plants; the third, waste-volume reduction in the textile sector; and the fourth, a decision-support system for environmental management. The LIFE programme was an obvious fit with ATP's latest objectives and the LIFE+ Environment 'BATinLOKO' project was set in motion in January 2009.

Gathering environmental performance data

One of the major difficulties of encouraging implementation of BATs across the textiles sector is how different individual



'BATinLOKO' produced a tool that allows textiles companies to understand which BATs they should implement to improve environmental performance and why

companies are from each other. What applies to one company will not necessarily apply to another. Environmental and economic costs will vary greatly depending on the materials being produced, the final product desired and the specific processes used. Some BATs might significantly reduce environmental and economic costs in one business, whilst being not particularly relevant for another.

The project therefore sought to deliver a means of calculating the likely environmental and economic benefits of implementing a BAT in the context of any specific business. The means to arrive at this was to study the impact of BATs on different kinds of business and to use the results to come up with a model that would predict the results achieved.

The model could then be applied to other businesses as a decision-making tool.

To identify the impact of any BAT, the project had to start by improving understanding of the specific situation of individual companies. Dionísia Portela of CITEVE was the BATinLOKO project manager. She explains that the project had to do a lot of work characterising current practice. “Companies will know their global data on issues such as water and energy consumption, but they often do not know the data associated with one process or technique.”

CITEVE asked interested textiles companies to contact them about participating in the project. Nine companies in the area around Vila Nova de Famalicão were selected as broadly representative of the sector. Investigative teams from CITEVE started gathering environmental data on each company, covering aspects including water usage, energy consumption, waste generation and water quality.

The project specifically investigated the effect on these environmental indicators of the implementation of 12 BATs, which were chosen for being representative of the industry and for not requiring large-scale investment. They covered different themes such as energy, emissions and water. They included heat insulation of pipes, automated dosing and dispensing systems; recovery and re-use of inputs; elimination of bleach use; and enzyme treatment.

In some cases, CITEVE asked a company to stop using a BAT for a short period to gather comparable ‘before and after’ data. In others, they supported the company in introducing a new technique and monitored the changes in environmen-



Nine textiles companies participated in the project, helping define the parameters of the online tool

tal performance. “The participation of the companies was crucial to the project’s success,” believes Ms Portela. “They did not receive an economic incentive from the project, but were glad to participate and to have the data we were able to provide them.”

Delivering practical tools for companies

Minho University was charged with developing models from all the before and after data to predict the impact of BAT implementation in any company. Teresa Amorim, Associate Professor of the Textile Engineering Department, explains that “We already knew theoretical equations to describe processes of the textile industry. But data from CITEVE was essential to calibrate models and identify the most important variables in determining the impact of each BAT.”

After much modification and almost continual refinement, the University team managed to define models that accurately reflected the results achieved in practice in the nine





The web tool created by the 'BATinLoko' team

participating companies. A different model was developed for each BAT, using different input variables to calculate the anticipated benefits. For example, key variables for different BATs might include the volume of water used, the diameter of the pipes, the required temperature of the process or the volume of chemicals added.

The models were used as the basis for one online tool that any textile company can use to estimate the likely benefits from implementing a particular BAT. Although the models themselves are complicated mathematical equations and algorithms, the tool is easy to use. The user selects the BAT they are thinking of introducing and enters their business-specific data for the relevant variables requested. The tool provides diagrams to help users correctly identify the inputs they need to enter into the calculations, which were introduced after tests with company representatives.

Based on the information inputted by the user, the tool calculates what environmental and cost benefits a company could expect from implementing the selected BAT. It also calculates the level of investment it should consider worthwhile. The tool even also allows technicians to print a summary of the cost-benefit estimates to present to a CEO. Each aspect is designed to facilitate decision-making in any individual business and improve the likelihood of the most relevant BATs being implemented in practice.

To support this online tool, the project delivered a manual that provides a methodology that a company should follow for implementing any BAT. It breaks the process down into manageable steps, setting out all the information needed to make the best decisions. It provides a definition of the 12 targeted BATs and all the relevant environmental indicators. It also sets out the range of environmental performance benefits achieved so far by each BAT in the Portuguese textile industry to help companies identify those BATs that could be most relevant to them.

Seeking a long-term impact

An important strength of the tool for its future impact on the textile industry is its flexibility. The tool can be updated as and when technological developments emerge within the existing BATs. It can also be expanded to cover many more BATs than the 12 covered by the project. The project team hope that the resources will be found to enable such an expansion over the coming years.

Some 30 companies had used the tool by the end of the project and ATP is playing a key and ongoing role in promoting it to its members. "When a company sees that others have taken real benefits from using the tool, it is easier to spread the message. This is a big success of the project," says Paulo Vaz. The project team are confident that many more companies will use the tool in the future as they look to improve their environmental performance and reap the economic advantages.

Ms. Portela concludes by highlighting that the results of the project are relevant beyond individual companies in Portugal. As well as noting that the tool is applicable to any textile company in any country, she points out that "the project results will be taken by APA to input into the next update meeting of the European BAT reference document (BREF)," illustrating how 'BATinLOKO' is pointing the way forward for the whole European textile industry.

Textiles companies participating in a 'BATinLOKO' information event



Project number: LIFE07 ENV/P/000625

Title: BATinLoko – Environmental performance indicators and their relation with economic factors in textile BAT implementation

Beneficiary: CITEVE – the Technological Centre for the Portuguese Textile and Clothing Industry

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Period: 01-Jan-2009 to 30-Jun-2011

Total budget: €312 000

LIFE contribution: €153 000



Poland: Recultivating urban lakes in Gniezno

An innovative project in the city of Gniezno has transformed the condition of two urban lakes for the better.



Summer bathing at Winiary Lake is now safer thanks to LIFE

Gniezno (population: c. 70 000) is one of the oldest and historically most important cities in Poland – its impressive cathedral hosted the coronations of two of the country's earliest kings in the 11th century, amongst other notable events.

As in many parts of Europe, 'progress' in 20th century Gniezno came at the cost of environmental degradation. "We have three beautiful lakes in Gniezno and over a lot of years, from the beginning of the 20th century, there was agglomeration pressure, so they became polluted. It was 100 years of devastation," says Jadwiga Trzcińska, joint coordinator of the 'Lake recultivation in Gniezno' project.

The municipal authority had been monitoring the condition of the lakes for a number of years and – aware that their condition was deteriorating – resolved to do something about it.

The biggest problem was the presence of phosphorus (P) in the lake sediments, which caused eutrophication, damaging fish stocks and leading to harmful blooms of bluegreen algae. Standard methods of recultivation¹ involve pumping sediment from a lake mechanically. However, as Ms Trzcińska explains, for Gniezno, where the lakes are located in the heart of the city and are shallow, this was seen as "very dangerous", firstly because of the possibility that it could spread the phosphorous throughout the lakes and "spoil the whole ecosystem" and secondly because of its potential impact on the city's cathedral: "It is located on the hill, and the hill is full of water, so if we take the water from the lake we could destroy the hydrological system inside the hill. And the whole town could collapse!"

¹ Recultivation is the process of making raw mineral soils fertile again through bioengineering and refertilisation

Trying something new

The joint coordinator and her colleagues at the municipal authority investigated alternative solutions and proposed a new method of recultivation for the two lakes within their remit – Winiary Lake and Jelonek Lake (the third lake in central Gniezno is privately owned).

Co-funding from the LIFE programme was secured for the innovative approach and the 'Lake recultivation in Gniezno' project set to work in February 2009. The first stage of the project involved assessing the condition of the two lakes and their catchment areas. As a result of this assessment, it was decided to first recultivate a retentive pond connected to Jelonek Lake and a ditch linking the pond to the lake. Reed beds were removed and banks rebuilt to capture run-off before it entered the water course.

The second phase of the project was the most important: deactivating the phosphorous in the bottom sediment. To achieve this, the project used two chemical compounds - PIX 111 and Phoslock – as a coagulant; this enabled a kind of 'phosphorous capture' to take place. Prior to application in the two lakes, it was necessary to analyse the chemical composition of the bottom sediment to determine the correct proportion of coagulant to be used.

Application was outsourced – by public tender – to a Poznan-based company, PROTE (Technologies for our Environment), which used a special boat to inject the coagulant into the bottom of each lake. GPS coordinates taken during prior monitoring provided a means of checking that the coagulant was being applied in the right place and in the right quantity.

The problem of bluegreen algae was addressed by placing bales of material on the sides of the lakes to prevent them regaining phosphorous from run-off.

Fish and plants

Once the coagulant had been added, the project team changed the fish stocks of both lakes. Cyprinidae (carps, bar-



*The presence of white-water crowfoot (*Ranunculus aquatilis*) is a sign of the lakes' improved condition*

bels etc) and Percinidae (perch) were netted and relocated to other lakes – more than half a tonne of fish in total. These species, which feed on zooplankton, were then replaced by pike, at a density of 1 000 individuals per hectare, to improve the overall aquatic ecosystems.

"The next step was to introduce macrophytes," says Ms Trzcińska. Some 7 000 plants in total were introduced to the two lakes. "Those plants help to take phosphorous from the water – they are very important," she explains.

"All the actions were checked and monitored simultaneously, so all the time we knew what was going on." Alongside continuous monitoring, continuous communication with the citizens of Gniezno was important to the success of the project. Initially, "people were very surprised, especially by the boat," recalls Ms Trzcińska. "They were swimming in the lake and everybody was asking 'what's going on?'. We had to translate

The innovative LIFE Environment project in Gniezno has achieved notable improvements in the water quality of both urban lakes (pictured: Jelonek Lake)



and we had to communicate and talk and talk that this is for the good of these lakes and that now we are grateful," she says. Talking also meant asking people not to feed aquatic birds in and around the lakes whilst the recultivation was going on.

LIFE co-funding also enabled the creation of recreational zones around the two lakes where citizens can relax or go for a swim. Although people already swam in the lakes, "before it was dangerous; now it is safe," says joint project coordinator, Piotr Wiśniewski.

Results and replicability

In line with its targets, the LIFE Environment project in Gniezno has achieved notable improvements in the quality of water in both lakes: total phosphorous content in the water decreased to 0.047 mg P/dm³ in Winiary Lake and 0.113 mg P/dm³ in Jelonek Lake (the goal was 0.1-0.2 mg P/dm³); Secchi's disc visibility, a measure of water clarity, increased to 0.9 m in Jelonek Lake and 2.9 m in Winiary Lake (target: 0.6-1.0 m); whilst levels of chlorophyll were reduced to 11.4 ppm in Winiary Lake and 19.8 ppm in Jelonek Lake in 2011 (one year after the end of the project - the planned value was 15 ppm). Furthermore, bluegreen algae have not been observed in either lake since the deactivation of the bottom sediments.

"We cannot compare the two lakes because they have a different history, different ecosystems: Jelonek Lake was polluted by factories but Winiary Lake didn't have any connections to the factories. Those lakes are different, but the results of the project are the same in each," notes Ms Trzczińska.

For her, one of the most memorable outcomes of the project occurred one fine spring day during the first year of implementation: "It was a miracle - one day the whole of Jelonek Lake was covered in a rare plant - white water-crowfoot (*Ranunculus aquatilis*). We were very surprised and very happy."

Bluegreen algae has not been observed in either lake since the deactivation of the bottom sediments (pictured: Winiary Lake)



Photo: Justin Toland



Project coordinators Jadwiga Trzczińska and Piotr Wiśniewski in front of Winiary Lake

The municipal authority continues to monitor water quality after-LIFE: "Two times a year we check if the parameters improve or decline - and they are stable," notes Ms Trzczińska. "If we had not done the project and had such high temperatures outside (30 degrees Celsius on the day of the interview), both lakes would be covered by dead fish because of eutrophication" she says.

LIFE funding was crucial to the city being able to carry out the groundbreaking project actions. "Without the money from the EU, from the LIFE+ programme we couldn't do it - it was the only chance to implement this method. LIFE+ saved our lakes, because for us, spending so much money would be impossible," highlights Ms Trzczińska.

Gniezno is not the only beneficiary of this project however. The recultivation methodology pioneered by the city and disseminated through various events during the course of the project, including a conference attended by more than 100 local government representatives, has since been applied by two municipalities elsewhere in Poland. It has also been the recipient of several awards, including the Polish government's "recultivation of the year", as well as LIFE Environment "Best" project status. "We are very proud of this method," says Ms Trzczińska.

Project number: LIFE07 ENV/PL/000605

Title: Lake recultivation in Gniezno - Recultivation of Jelonek and Winiary lakes in Gniezno by inactivation of phosphorus in bottom sediments

Beneficiary: Town of Gniezno

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Period: 01-Feb-2009 to 30-Nov-2010

Total budget: €432 000

LIFE contribution: €216 000



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