



European
Commission



Best LIFE Environment projects 2014

LIFE Environment

Environment



EUROPEAN COMMISSION ENVIRONMENT DIRECTORATE-GENERAL

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Foreword



Photo: European Commission

Markéta Konecna
LIFE Environment "Best of the Best" coordinator 2014
Department of EU Funds,
Ministry of the Environment
of the Czech Republic

The 11th edition of the LIFE Environment Best Awards took place in Brussels in June 2015 at a joint ceremony with the LIFE Nature Awards, held during EU Green Week. This annual event is a means of acknowledging the work of the most outstanding LIFE Environment projects completed by the end of the previous calendar year.

As the LIFE Programme's National Focal Point for Czech Republic I had the privilege for the second time of coordinating the process by which the National Focal Points of the Member States selected the 'Best of the Best' LIFE Environment projects. I would like to thank my colleagues for their input as we chose six "Best of the Best" projects, with a further 16 projects awarded LIFE Environment "Best" project status. These 22 projects were joined by a further three Information & Communication projects with an environmental theme, in a process coordinated by Dirk Schaap (see below).

For me, the selection process was a reminder of the powerful practical impact LIFE funding can have. By supporting projects that implement policy, tackle environmental challenges and maintain ecosystem services the LIFE programme is helping to enrich and improve the lives of citizens across the EU.



Photo: European Commission

Dirk Schaap
LIFE Information & Communication "Best of the Best" coordinator 2014
Netherlands Ministry of Infrastructure
and the Environment

This is the second year that LIFE Information & Communication (LIFE INF) projects with an environmental focus have been recognised at the LIFE Environment Awards. Introduced under LIFE+ in 2007, the aim of LIFE INF projects has been to disseminate information, raise the profile of environmental issues, or provide training and awareness-raising for the prevention of forest fires.

With so many outstanding candidates, narrowing the list down to just three projects - two "Best of the Best" and one "Best" - was not easy. What we on the selection panel looked for were projects that solved an environmental problem through an information or communication action, or strategy, where communication or information was clearly the best, or only, instrument to address the problem. Other key criteria included innovativeness, replicability and widespread applicability.

The Slovenia WEEE campaign visited more than 200 schools with a novel travelling exhibition to educate children about the importance of recycling and reusing e-waste, instilling the principles of the circular economy in the next generation of citizens. The other Best of the Best project, RESTORE, created a lasting international network of river restoration experts, practitioners, policymakers and river basin planners. The Best LIFE INF project, Investing in Water, addressed the key challenge of water scarcity in Malta, showing hotels and other enterprises ways of reducing water consumption without harming business.

All three projects inspired their target audiences and provide valuable lessons about successful environmental communication.





BEST LIFE ENVIRONMENT PROJECTS

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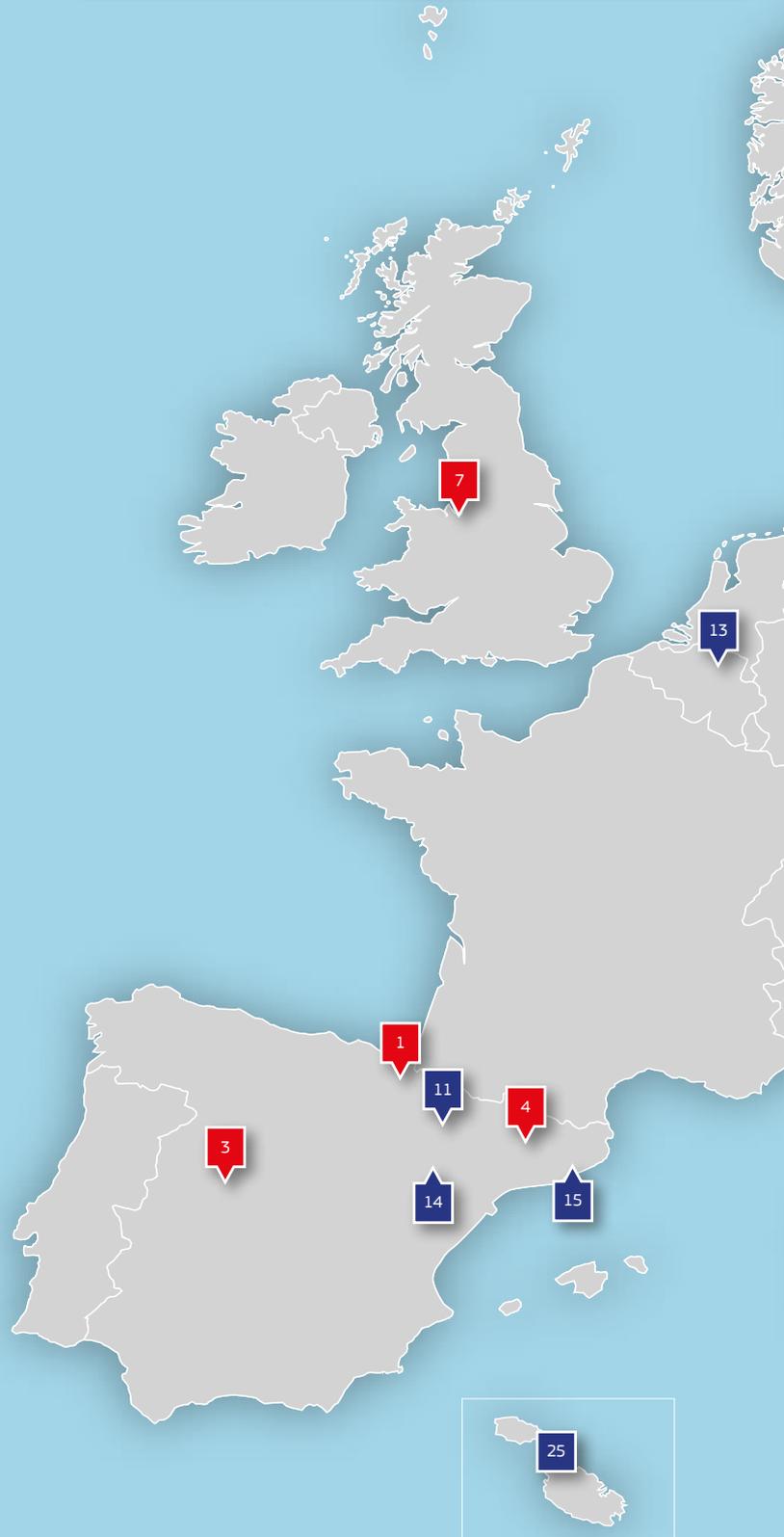
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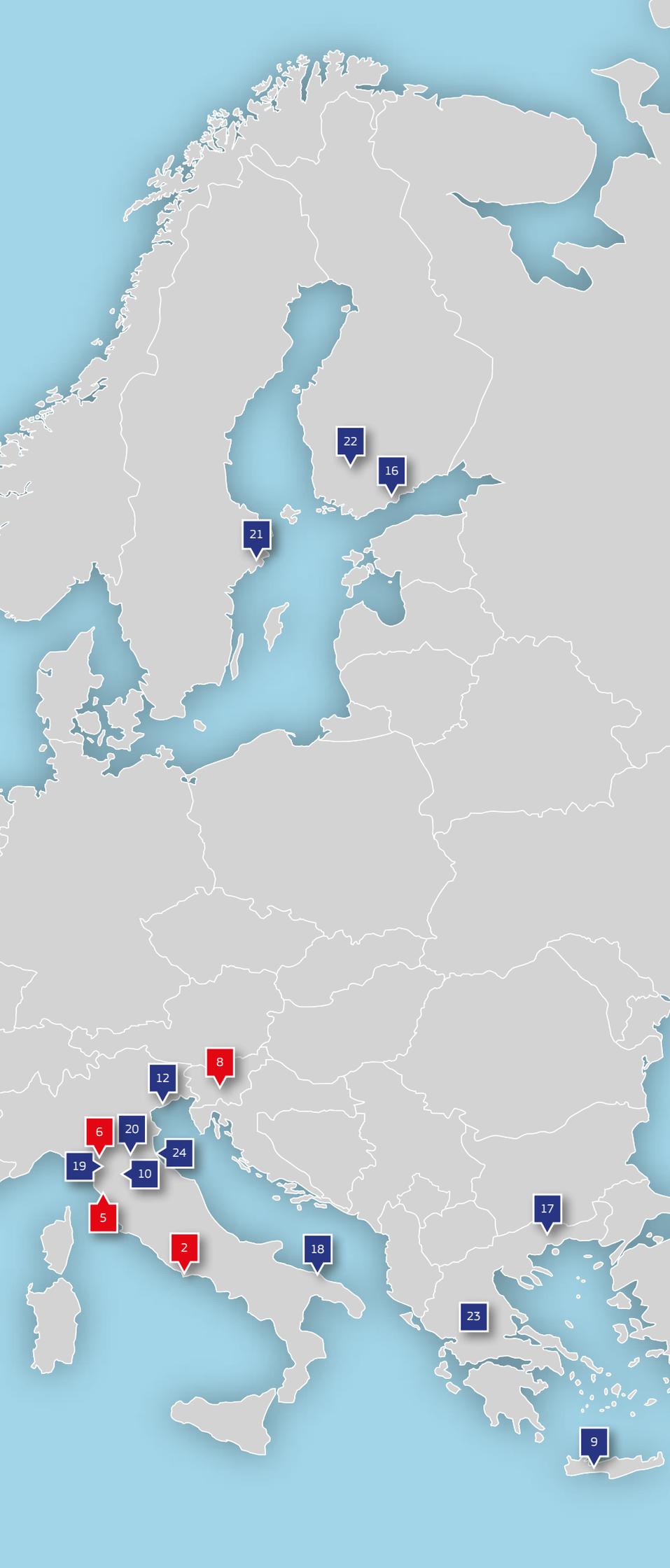
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LIFE ENVIRONMENT BEST AWARD WINNERS 2014





BEST OF THE BEST PROJECTS

1 LIFE08 ENV/E/000114

POWER

Project for Optimisation of Water and Emissions Reduction

2 LIFE08 ENV/IT/000406

REWETLAND

Widespread introduction of constructed wetlands for a wastewater treatment of Agro Pontino

3 LIFE09 ENV/ES/000441

AgriClimateChange

Combating climate change through farming: application of a common evaluation system in the 4 largest agricultural economies of the EU

4 LIFE09 ENV/ES/000484

DEMONSTRATION OF KDV TECH

First Implementation Of A New Waste Recovery Technology Converting The Msw From A Representative Urban Region Into Synthetic Diesel Fuel

5 LIFE09 ENV/IT/000056

WIZ

WaterZe spatial planning: encompass future drinkwater management conditions to adapt to climate change

6 LIFE09 ENV/IT/000208

AQUA

Achieving good water Quality status in intensive Animal production areas

7 LIFE09 INF/UK/000032

RESTORE

RESTORE - Rivers: Engaging, Supporting and Transferring knOwledge for Restoration in Europe

8 LIFE10 INF/SI/000139

Slovenia WEEE campaign

Raising awareness of the importance of environmentally sound management of WEEE among identified target groups in Slovenia

BEST PROJECTS

9 LIFE07 ENV/GR/000280

PROSODOL

Strategies to improve and protect soil quality from the disposal of olive mills' wastes in the Mediterranean region

10 LIFE07 ENV/IT/000434

MHyBus

Methane and Hydrogen blend for public city transport bus: technical demonstrative application and strategic policy measures

11 LIFE08 ENV/E/000136

ZERO-HYTECHPARK

Zero emissions using renewable energies and hydrogen technologies in building and sustainable mobility in Technology Parks

12 LIFE08 ENV/IT/000399

EnvEurope

Environmental quality and pressures assessment across Europe: the LTER network as an integrated and shared system for ecosystem monitoring

13 LIFE09 ENV/BE/000409

ATMOSYS

Policy support system for atmospheric pollution hot spots

14 LIFE09 ENV/ES/000435

LASERFIRING

Climate Change Adaptation of the Structural Ceramics Industry by Decreasing the Firing Temperature Using Laser Technology

15 LIFE09 ENV/ES/000457

GREENING BOOKS

Improving the environmental performance of publications from design to lecture!

16 LIFE09 ENV/FI/000569

GISBLOOM

Participatory monitoring, forecasting, control and socio-economic impacts of eutrophication and algal blooms in river basins districts

17 LIFE09 ENV/GR/000294

WASTE-C-CONTROL

Waste management options for greenhouse gases emissions control

18 LIFE09 ENV/IT/000061

P.R.I.M.E.

Posidonia Residues Integrated Management for Eco-sustainability

19 LIFE09 ENV/IT/000068

WASTE-LESS in CHIANTI

Waste Prevention and Reduction in the Chianti Territory

20 LIFE09 ENV/IT/000092

OPERA

An integrated assessment methodology to plan local cost-effective air quality policies harmonized with national and European actions

21 LIFE09 ENV/SE/000352

Pure Energy Separator

Pure Energy Separator - Innovative Centrifugal Separator Technology for Energy Recovery and Oily Waste Volume

22 LIFE10 ENV/FI/000062

ASROCKS

Guidelines for Sustainable Exploitation of Aggregate Resources in Areas with Elevated Arsenic Concentrations

23 LIFE10 ENV/GR/000617

ArcFUEL

Mediterranean fuel maps geodatabase for wildland & forest fire safety

24 LIFE10 ENV/IT/000373

LOWaste

Local Waste Market for second life products

25 LIFE10 INF/MT/000091

Investing in Water

Achieving Reduction in Water Consumption by Business in Malta

The LIFE Best Awards

The most inspiring LIFE projects completed during 2014 were acknowledged at a prestigious award ceremony which took place during EU Green Week in Brussels in June 2015.



Photo: EC - Patrick Mascant

The winners of the Best LIFE Environment awards for 2014

The objective of the LIFE Environment Best Awards is to help improve the dissemination of LIFE project results by clearly identifying those projects whose results, if widely applied, could have the most positive impact on the environment.

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, before a final selection undertaken by the Member States. Projects are evaluated according to a number of criteria: their contribution to immediate and long-term environmental, economic and social improvement; their degree of innovation and transferability; their relevance to EU policy; and their cost-effectiveness.

The 2014 awards recognise the achievements of 25 projects from nine different EU Member States completed by the end of last year. These projects cover a wide range of topics and subjects, from improving soil, air and water quality to demonstrating new industrial processes, trialling new fossil fuel-free public transport technologies and reusing waste, amongst other things. The winners include three LIFE Information & Communication (INF) projects with an environmental theme, including the first "Best" project from Malta. The most exceptional eight projects were accorded

the ultimate accolade of "Best of the Best" LIFE Environment project (see pp. 6-29).

Karl Falkenberg, Director-General for Environment at the European Commission, presented the awards. He spoke about the importance of LIFE and how some "tremendous achievements" have been made through the programme: "We have funded a whole range of products that have helped citizens and governments green their respective environments and economies and, what's more, through LIFE we have helped share this experience and knowledge."

People power

To increase public awareness of the work of the LIFE programme, this year saw the launch of the LIFE Community awards. All Best of the Best projects were entered into an online public vote with one winner for Environment and one for Nature projects. The Italian project, REWETLAND (see pp. 9-11) won the Environment vote.

Presenting the award, Hervé Martin, Head of DG Environment's LIFE Environment Unit, pointed out that LIFE has funded more than 4 000 environmental solutions since 1992. Mr Martin added that he was pleased to see water was a concern for the citizens who voted for REWETLAND.



BEST LIFE ENVIRONMENT PROJECTS

BEST OF THE BEST PROJECTS

Spain: **POWER** saves water and energy

The LIFE POWER project demonstrated that new ways of watering crops and urban green spaces can save water and significantly reduce energy consumption. Pilot installations saved 100 000 m³ of water and reduced mains energy consumption – notably for water pumping – by around 60%.



LIFE POWER demonstrated energy savings from efficient watering systems

Water scarcity is an ever-increasing concern across the EU and particularly in water-stressed countries such as Spain. Furthermore, watering typically involves significant energy consumption from transporting water to where it is needed, whether by pumping or other means.

The LIFE POWER project (**LIFE08 ENV/E/000114**) was developed in Zaragoza, Spain as a direct follow-up to the successful LIFE OPTIMIZAGUA project (**LIFE03 ENV/E/000164**), which developed automated technologies that reduced water consumption, by watering only as much as necessary and at the most effective times.

“OPTIMIZAGUA focused on saving water, but an unexpected result was the energy savings we saw were possible from saving water,” explains Nieves Zubalez, project manager of LIFE POWER. “We wanted to build on that experience to show how much energy could be saved.”

“Saving water goes hand in hand with saving energy,” says Cesar Romero, director of the project beneficiary, Fundación

San Valero. “For example, reducing consumption of diesel for pumping water is crucial environmentally. Saving energy gives a much clearer financial incentive to the farmer to reduce water consumption, since energy is a more significant and unpredictable cost than water, which is still remarkably cheap.”

LIFE POWER sought to demonstrate energy savings from improved watering systems in the different contexts of agricultural fields and urban green spaces. It aimed to combine techniques for more efficient watering with approaches for more sustainable water use and renewable energy technologies.

Renewable energy in agriculture

For the agricultural pilot, the beneficiary worked with the Montesnegros Irrigation Community. Javier Pomar, one of the members of the irrigation community explains its interest in the project: “We had good, modern irrigation systems, but we were ashamed of how much diesel we were consuming – as

much as 11 000 litres a day – to pump water to where it was needed in the fields. The economic and environmental costs of this were dramatic.”

The irrigation community began exploring solutions involving biomass: “We wanted to generate energy with what we produced in the area. This seemed to have some potential, but we lacked enough primary material and the efficiency was not as good as hoped,” explains Mr Pomar. The option of using wind energy was also considered, but there were restrictions on use of turbines in some of the project areas, which were within the EU’s Natura 2000 network of protected nature areas.

Solar energy had no such disadvantages and was ideal for the sunny climate. The project installed solar panels at the pilot area’s main pumping station and each of the six ‘stations’ that made up the automated watering system, powering the system solely using solar energy.

There was sufficient surplus solar energy to enable the project to run a bilge pump that recovered runoff water and water lost from the pond located at the pilot site’s pumping station. This activity recovered more than 83 000 m³ of water for irrigation purposes, completely powered by clean energy.

Energy-efficient watering

“The project enabled us to experiment with the watering system,” highlights Javier Calvete, president of the irrigation community. “Drip watering systems require less water pressure than sprinkler systems which reduces the energy need for pumping. We are currently doing trials to see whether drip watering works for all our crops.”

During the project, the irrigation community worked on two demonstration corn field plots in La Almolda, Bujaraloz in the Zaragoza region: a 1 ha plot using sprinkler irrigation and a 3 ha plot with a drip irrigation system. Drip irrigation can reduce the water lost from being blown off target or evaporating in the air when using a sprinkler system.

“However, the most significant savings come because the system closes automatically if it detects a leak and then alerts us so that we can go and repair it,” explains Mr Pomar. The project calculated that the system saved nearly 235 000 m³ of water in this way, which also avoids the energy consumption associated with pumping more water to replace that which is being lost.

Urban green space pilot

For the pilot urban activity, the beneficiary partnered with the municipality of Calatayud. “We wanted to work with a public entity at local level, which would have the flexibility to carry out a pilot project,” explains Mr Zubalez. Calatayud was interested

because maintaining a municipal swimming pool and football pitches consumes a lot of water.

“The water in public swimming pools is gradually refreshed,” explains Mr Romero. “The standard practice is simply to pour away the water, since it contains chlorine. However, the project installed a green filter which enabled the water to be used for watering both the football pitches and other green areas around the municipal sports complex.”

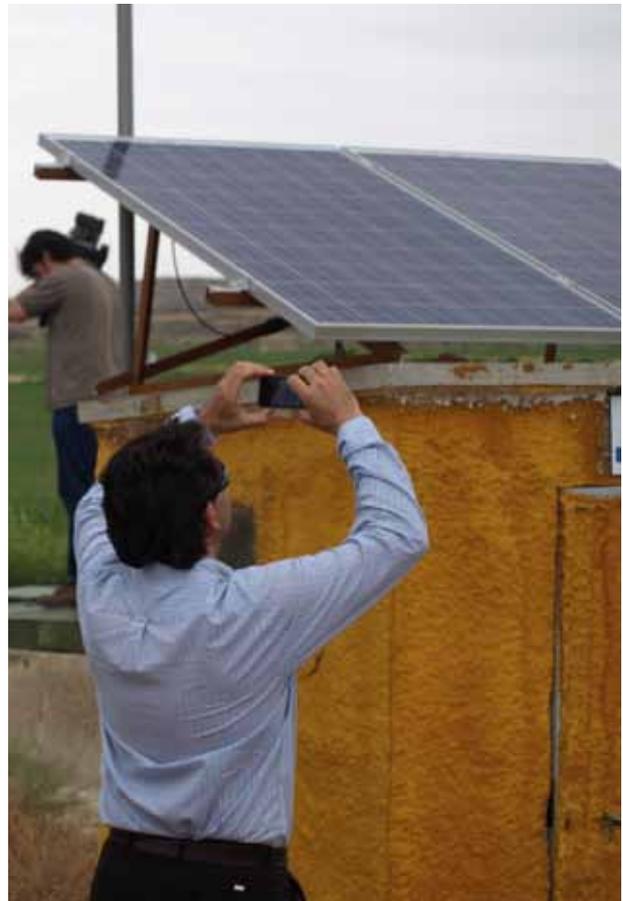
This practice reduced the consumption of public drinking water supplies by over 50%. The green filter is also a very energy efficient means of acquiring irrigation water.

Total benefits and transferability

The LIFE POWER project delivered an 86% reduction in water consumption, with 46% of the improvement coming from greater irrigation efficiency, including the use of recovered water, the avoidance of leaks and more efficient drip watering techniques. The energy savings were an equally impressive 74%, with 39% of the savings resulting from the more efficient watering.

The climate change benefits could be extremely significant. The project itself reduced calculated CO₂ emissions by 116 tonnes.

The energy efficient irrigation system cut CO₂ emissions by 116 tonnes





The project demonstrated a drip irrigation system that closes automatically if it detects a leak

However, as Mr Romero highlights, “what is most interesting about this project is the extremely high replicability of the irrigation models in other areas.”

The project did not content itself with demonstrating the water and energy savings, but actively sought to promote transfer of the models. The regional government of La Rioja developed a GIS map, which profiled areas across Spain, based on criteria such as geography and climate. The project also worked with a partner in Italy to develop a similar map for the area around Turin.

This system identified more than 130 locations which had the strongest potential to benefit from implementation of POWER’s methods. The San Valero Foundation then conducted some targeted dissemination of the project results to relevant bodies in these areas.

More than 50 of these bodies - including public authorities, irrigation communities and a quarrying company - have signed a voluntary commitment to support and implement the good water management models developed. It is to be hoped that this can ensure a real and long-term legacy for the project.

Sustainable solutions

“Technically the project was a complete success and provides a model that should be used whenever a new pumping station is foreseen,” says Mr Pomar. “The main challenge to replication is political uncertainty around the renewable energy sector. As a result of the financial crisis, the government has moved

away from subsidising renewable energies to taxing them. This makes it much more difficult to plan these long-term investments.”

Recognition of LIFE POWER as a Best of the Best LIFE project is particularly important in this context, as Carmelo Lorente from the Montesnegros Irrigation Community explains: “we are very proud to have won an environmental prize. It shows the work that farmers like us are doing to protect the environment. Hopefully it makes people realise what we are doing and do more to support us.”

“We are important managers of soil, animals, villages and the natural environment,” Mr Lorente continues. “We need sustainable solutions such as LIFE POWER. The only alternative is to stop watering and that means abandoning the territory. The consequences of that would be dramatic socially and culturally, but also in terms of biodiversity.”

Project number: LIFE08 ENV/E/000114

Title: POWER - Project for Optimisation of Water and Emissions Reduction

Beneficiary: Fundación San Valero

Contact: María Nieves Zubalez Marco

Email: nzubalez@svalero.es

Website: www.lifepowerproject.eu

Period: 01-Jan-2010 to 30-Sept-2013

Total budget: €1 421 000

LIFE contribution: €651 000



Italy: Treating wastewater with wetlands

The REWETLAND project's success in demonstrating new ways of tackling water pollution in Italy's Pontine Plain has been recognised with not one, but two LIFE awards.

The Pontine Plain (Agro Pontino) is a vast area of reclaimed former marshland south of Rome. It is characterised by partially unplanned urban development and intensive agricultural practices, which have led to severe water pollution. Water quality is assessed as "moderate" to "bad"; falling short of the requirements of the Water Framework Directive (WFD).

"The plain is still very rich in water, which is why agriculture is important here, but the problem is that people draw too much water - there are something like 30 000 legal wells and an estimated 90 000 illegal wells - and so there is an intrusion of salt from the sea. This is a big environmental problem, especially because the Pontine Plain has become famous for [water intensive] kiwi fruit," explains Flavio Camerata of U-Space, a partner in the LIFE REWETLAND project (**LIFE08 ENV/IT/000406**). Urban sprawl is another environmental problem, "many settlements here do not have sewers. It's a source of pollution for the canals," says Mr Camerata.

The REWETLAND project aimed to tackle these issues and develop an integrated strategy for more sustainable use of wa-

ter resources in the plain. "The main objective was to demonstrate the feasibility and effectiveness of constructed wetland systems in solving the problem of nitrate pollution of surface waters in the Agro Pontino. Secondly, the project intended to raise awareness and involve local stakeholders in this issue, in particular the farming sector. Another objective was to draw up a programming and operational instrument able to organise and promote the future development of constructed wetland systems," explains the project's technical assistant, Andrea Lorito.

Four pilot projects

To achieve the first objective, the project team tested innovative natural water purification and water management systems on sites representative of the Pontine Plain: a protected natural area; an urban area; and a drainage canal built to reclaim land. Good management practices were introduced at a wine farm as part of a fourth pilot project.

Natural water purification involves the use of aquatic plant species with filtering capacities, such as the common reed

The Pontine Plain (Agro Pontino)



(*Phragmites australis*), bulrush (*Typha latifolia*), blady grass (*Imperata cylindrica*), simplestem bur-reed (*Sparganium erectum*) and yellow iris (*Iris pseudacorus*).

The first pilot project involved the construction of filter ecosystems made up of different types of basin – a free surface water basin, subsurface flow basin and a lagooning basin – at two locations near Lake Fogliano in the Circeo National Park (a Natura 2000 network site).

Lake Fogliano is one of several shallow, brackish coastal lagoons located within the national park. “The problem is that because the water from the canals is so polluted it has been necessary to block that water from going into the lake. This has made it more salty than the sea,” explains retired former REWETLAND project manager, Carlo Perotto, who adds that one of the aims of the project was to find a long-term solution to this problem so that freshwater could be reintroduced to the coastal lagoons.

In the second pilot area, the project built a peri-urban park in the coastal resort town of Marina di Latina that integrates natural water purification infrastructure with leisure facilities – paths for walking and cycling and landscaped green areas. The constructed wetland covers an area of some 3 200 m² and is composed of two sub-surface horizontal flow basins and two free surface water basins. Polluted waters of the Colmata Canal are treated and discharged into the Mastropietro Canal.

The new park at Marina di Latina is a stepping stone between the Pontine Archipelago and the Ramsar and Natura 2000 network sites of the Circeo National Park, both important areas for migrating birds. “Sites of the pilot actions have witnessed an increase in biodiversity, especially birds,”

says Mr Lorito. The fact that the pilot sites also provide “useful community services” helps increase their “acceptability” to ordinary citizens, he adds.

The third pilot, carried out along the banks of two of the canals of the Land Reclamation Consortium of Agro Pontino, demonstrated the use of natural buffer strips for both water purification and erosion control. The work covered a total length of 18 km.

The final pilot project was located in the vineyards of the 150 ha Casale del Giglio winery and established measures for controlling surface water runoff as part of a demonstration of good water management practices in a farm setting.

“Farmers are very cautious because they are afraid that these kinds of projects will result in a reduction in the amount of productive land available to them,” explains REWETLAND project manager, Nicoletta Valle. “The farm where the pilot project took place makes quality wine, so they were culturally prepared and it was not so difficult. Usually things are different. Our approach was to try to demonstrate to the farmer that what the project planned to do would also improve production.”

Optimising bio-filtration

Monitoring of the impact of the four pilots is an important part of REWETLAND’s After-LIFE plan. Monitoring also includes adjustments to optimise the work done during the project. For instance, Ester del Bove from Circeo National Park explains that at the Villa Fogliano pilot, “we are trying to understand what is the best form of feeding the basin – during the summer when there are a lot of visitors it is sufficient to use wastewater from the septic tank; in other

The project used bio-filtering plants to decontaminate the water



seasons we need to work out how to feed the basins from the canal because otherwise there is not enough water and the integrity of the bio-filtering plants is compromised.”

“The system works, but we need to find the right calibration,” says Mr Lorito. Bio-filtration “could be applied in a lot of different cases,” says Mr Camerata. “Even if there is traditional wastewater treatment you can put one of these systems downstream to make the water even cleaner.”

“The methodology proposed by the project could be replicated in similar situations in Europe, for example, with non-point source pollution from agriculture in modified or artificial water bodies, particularly in the Mediterranean Basin,” believes Mr Lorito.

Environmental Restoration Programme

In parallel with the implementation of the pilot projects, the REWETLAND team drafted an Environmental Restoration Programme (ERP) for the Pontine Plain. “There is a regional plan, the Water Safeguard Plan, which is connected to the WFD at regional level,” explains Ms Valle. “What we did in the REWETLAND project is to make a programme connected to the regional plan which is like an operational plan of the regional programme. This ERP has been subject to a strategic environmental assessment and Lazio region is now in the process of approving the provincial plan as an annex to an updated regional Water Safeguard Plan...This is an important achievement,” she says.

“The ERP comprises an action plan, which defines the activities necessary for the achievement of its objectives, a set of guidelines for its implementation, and project sheets containing operational examples,” explains Mr Lorito, adding that, “it contains actions concerning the creation of new constructed wetlands and buffer zones along the canals, but also ‘softer’ activities such as the promotion of public awareness and good practice.”

“The problem is that ordinary people here are not aware that the land used to be marshes. What prevents them from coming back is a very complex hydraulic system. If we switch off the power to the pumps, the marshes will be here again,” notes Ms Valle.

Many of the ERP’s awareness-raising measures replicate actions carried out by the REWETLAND team. The LIFE project did much to increase awareness amongst local people, holding nine community activities and more than 40 dissemination events over four-and-a-half years. “The theme of water quality, little known locally, has emerged as one of the most relevant environmental issues in the province,” says Mr Lorito. Important lessons have also been learned:

LIFE Community award winner!

The LIFE Community awards were launched for the first time this year, with the aim of increasing awareness of the work of the LIFE programme. Chosen by an online public vote from the 13 Best of the Best projects, one winner was selected for the Nature and the Environment categories.

Winning the Community Award “has been a great satisfaction and an acknowledgement of the good work done,” says Andrea Lorito. Project manager Nicoletta Valle thinks that those who voted for REWETLAND may have done so because of “the combination of the pilot projects with a much broader vision – the Environmental Restoration Programme – which we are working to implement in the future.”



“If we were starting the project now, we would probably try to start the public participation activities earlier, and to put more effort in the involvement of the farming sector,” he adds.

Project number: LIFE08 ENV/IT/000406

Title: REWETLAND - Widespread introduction of constructed wetlands for a wastewater treatment of Agro Pontino

Beneficiary: Provincia di Latina

Contact: Nicoletta Valle

Email: nicoletta.valle@rewetland.eu

Website: www.rewetland.eu/life/

Period: 01-Jan-2010 to 30-Jun-2014

Total budget: €3 707 000

LIFE contribution: €1 451 000



Spain: Adopting climate-friendly agricultural practice

Addressing the adverse impacts of climate change is one the biggest environmental challenges of our time. The AgriClimateChange project demonstrated both mitigation and adaptation agricultural practices that are informing EU policy.



Photo: NEEEMO EEIG/Alva Soppa/ra

AgriClimateChange trialled 127 climate friendly agricultural techniques in the Valencia region

The AgriClimateChange project (**LIFE09 ENV/ES/000441**) took place in the four largest agricultural economies in Europe. It implemented climate change-related environmental practices on 24 farms in France (mostly in the south-west), 48 in Spain (Valencia, the Canary Islands and Murcia), 24 in Italy (Umbria) and 24 in Germany (Baden-Württemberg). These practices dramatically lower the carbon footprint of the sector, reducing emissions, fertiliser and pesticide use and energy consumption, as well as helping the sector become more resilient to the impacts of climate change – such as water shortages, extreme weather events (flooding and droughts) and milder winters and longer summers.

The emphasis of the AgriClimateChange project was to produce feasible and economically viable measures. Such meas-

ures involve agronomic practices that have “crosscutting benefits and therefore fits into farmers’ diversity of interests,” says Jordi Domingo of the Fundación Global Nature, the coordinating beneficiary. The project also aimed to carry out a wide range of measures – 127 different farming methods were trialled in the Valencia region alone – in order to bolster the impact of its results. “Once you have this pool the conclusions that you can reach are really powerful,” he says.

“We realised that measures that had a significant impact on climate but a reduced impact on other aspects would not be so successful,” explains Mr Domingo. “This was due to the fact that in real life farmers are concerned about different aspects of their farm management. And these concerns will be very different depending on the farm’s activities, location, current challenges and so on.”

As a result, Mr Domingo acknowledges that it is not always straightforward to determine whether a farmer will be receptive to the project's proposals. For this reason, the project team's approach was to work closely alongside the farmers involved in the project, building relationships and listening to the farmers' needs. It carried out initial farm assessments with a software tool developed from the experience of the project partners, especially the French agriculture and environment association, Solagro. Experts from the project partners in the four countries then used this assessment data to develop action plans with the farmers.

These plans consisted of classic mitigation practices such as the planting of cover crops, improving irrigation efficiency, the development of ecological infrastructure, integrated pest management and achieving self-sufficiency of food for livestock. At one particular farm in the region, this diversification of measures is apparent. The organic citrus fruit farmer, Alfons Domínguez, has planted species-rich hedgerows to afford his orange, lemon and avocado groves better protection against the increasingly hot summers and to nurture natural pest killers (avoiding the need for pesticides). He is also using a range of cover crops, including alfalfa that can be used as animal fodder. This leguminous plant helps to retain moisture and fix atmospheric nitrogen in the soil.

The hedgerows also have the benefit of mitigating the soil erosion that is a common problem for farmers that are not undertaking conservation measures. With the increased incidence of extreme weather events – such as torrential rainstorms – the hedges and cover crops serve to retain some of the runoff in the fields. Indeed, the rich ochre of the soil on Mr Domínguez's farm stands in contrast to the paler soil found on neighbouring farms and is an immediate visual clue to the fertility of his land.

Spreading the word

For farmers such as Mr Domínguez the impact of climate change is already evident. In short, rainfall is down and temperatures are up to the extent that he is now adding to his output more 'tropical fruit' (namely, mango, lime and papaya), which in Spain were previously grown only in warmer regions farther south. Such diversification has the commercial advantage of allowing him to harvest produce all-year-round.

Mr Domínguez has met with other farmers eager to understand the approach that he is taking on his farm. Such word-of-mouth communication is essential if widespread change is to occur. Farmers must also better understand the link between their agricultural practices and the climate. "Climate change is a trend and some farmers are not inter-

ested in what 'may' happen in the future," explains Mr Domingo. To overcome this barrier to change, he and his team are making the demonstrable business case for adapting to a changing climate and reducing energy consumption.

The approach, he emphasises, should be adapted to take account of local economic conditions. For example, technically difficult solutions and those that require large investments, such as biogas plants, may not be the priority for Spain and, in particular, his region where farmers own small plots.

One such local solution that Mr Domínguez has successfully tested is the use of manure as a fertiliser. This significantly improves the structure and fertility of the soil in the long term and, moreover, has a low carbon footprint.

Farmers participating in the LIFE project were able to share their experiences with those from other regions at the project's European conference on farming and climate change in Toulouse. More than 150 attendees learned about the results of AgriClimateChange.

The project targeted its dissemination activities at key stakeholders such as farmers, farmers' unions, professional associations, consumers and agricultural and climate change experts. Given the diversity of the sector, the communications campaign was designed to be wide reaching, consisting of a website, notice boards, press releases, radio

Farmers participating in the project have shared their experience with those from other regions





Citrus fruit farmer Alfons Domínguez is also planting a range of cover crops that can be used as animal fodder, such as alfalfa

and TV programmes, specialised press articles, and agricultural fairs and events for farmers. The campaign reached more than 650 farmers and resulted in the publication of more than 300 items of related news. During the lifetime of the project, the website attracted some 71 000 unique visitors (and more than 600 000 hits); the manual was downloaded more than 3 300 times and the partners participated in more than 70 events.

Influencing legislation

An important aspect of the AgriClimateChange project was its focus on ensuring it also had an impact at European level. The project's results lent weight to its call for EU policymakers to include climate change actions in European legislation. In order to achieve this goal, the project team organised two meetings with European Commission officials and two breakfast meetings at the European Parliament. These meetings resulted in a request for policy proposals and advice on how to present them in the correct format, says Mr Domingo.

In spite of the comprehensive analysis of the project performance, he was initially, "quite pessimistic" about the impact it would have on the EU. "But we were welcomed," he says. "The project's report to the European Parliament included a set of measures to achieve realistic climate change mitigation and adaptation at farm level, including a short description of each measure, the expected impact at the EU level, the constraints to be overcome and a proposal for including the measures in different regulations." In this way, the report's authors detailed the different possibilities, such as

improving the greening of CAP Pillar I or including agri-environmental measures in Pillar II.

The project was also invited to the 4th Meeting of the Expert Group for Sustainability and Quality of Agriculture and Rural Development. Furthermore, it carried out lobbying activities in the four countries where it was active, so as to influence regional and national governments. For example, it held meetings with the Spanish ministry of agriculture, food and environment, the French ministry of environment (ADEME), the Italian agricultural ministry and the regional government of Baden-Württemberg (Germany). "Some of the measures promoted and tested during the project were sent to the Spanish ministry to be considered in the diffuse sectors roadmap for climate change mitigation in Spain," Mr Domingo adds.

Project number: LIFE09 ENV/ES/000441

Title: AgriClimateChange - Combating climate change through farming: application of a common evaluation system in the 4 largest agricultural economies of the EU

Beneficiary: Fundación Global Nature

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Period: 01-Sept-2010 to 31-Dec-2013

Total budget: €1 589 000

LIFE contribution: €794 000



Spain: Converting waste to fuel

The Demonstration of KDV Tech project showed how rejects from the municipal waste recycling process can be converted into diesel, cutting the amount of biodegradable waste going to landfill.



Photo: NEMO BEIG/Imas Ramos

Rejects from Griñó's waste treatment plant are shredded to produce the solid recovered fuel which is processed to make DieselR

A high proportion of municipal waste in Spain is still disposed of in landfill. Sorting this waste enables materials such as glass, paper and plastics to be recovered and recycled. However, some items are rejected during the sorting process, for example, small pieces of plastic. These fractions are generally sent to landfill, despite being biodegradable.

The Demonstration of KDV Tech project (**LIFE09 ENV/ES/000484**) aimed to show this rejected material could be converted into synthetic diesel, suitable for replacing conventional diesel, thus reducing the amount of waste going to landfill. The project developed the technology to transform the waste into diesel, as well as building a pilot plant to demonstrate the feasibility of the process.

The pilot facility was constructed at the project beneficiary Griñó Ecologic's waste treatment plant in Constantí, in Tarragona province. It is capable of treating up to 30 000

tonnes/yr of solid recovered fuel (SRF), equivalent to the waste generated by 180 000 inhabitants in an urban area. Rejects from the sorting plant are passed through a shredder to produce SRF, which is mainly composed of plastics, as well as some waste textiles, paper/cardboard and wood.

The SRF is mixed with used industrial mineral oil to form a fluid, which passes through the pilot plant to the central step of the process - the catalyser. Here, the long carbon chains within the fluid (polymers) are broken down into shorter carbon chains and a gas is formed. This gas is then condensed to produce high quality synthetic diesel, branded as DieselR.

Innovative methods and technology

The liquefaction of waste in order to convert it into diesel was an important milestone in the project: it enables a wide range of materials to be processed. Griñó Ecologic pioneered the use of this technique for making diesel. The catalytic



depolymerisation technology was developed for the project by the University of Tarragona. It provides a clean, quick and efficient treatment for biodegradable non-recyclable waste fractions and allows more value to be extracted from the diesel production process. As Raúl Ramírez, project director, explains, “the catalyser reduces the temperature needed to produce the fuel, cuts the amount of waste gases generated when compared to existing technologies and produces more diesel.”

The production process does not require the addition of chemicals; it generates no liquid effluent and only a small amount of waste gas is emitted. The company says the new technology has found greater public acceptance than conventional waste management techniques, due to the absence of nuisance smells and particles.

It also facilitates compliance with a range of EU legislation, such as the Waste Framework Directive (2008/98/EC) and Directive 1999/31/EC, which requires Member States to reduce the amount of waste sent to landfill, as well as the Renewable Energy Directive (2009/28/EC), through its contribution to climate change mitigation and biofuel production.

Operating tests at the pilot plant began in September 2012, with a treatment rate of 200 litres/hour. After resolving some problems and making technical improvements, the rate was raised to 900 litres/hour. Further modifications enabled the project to increase the treatment rate to 1 800 litres/hour by October 2013.

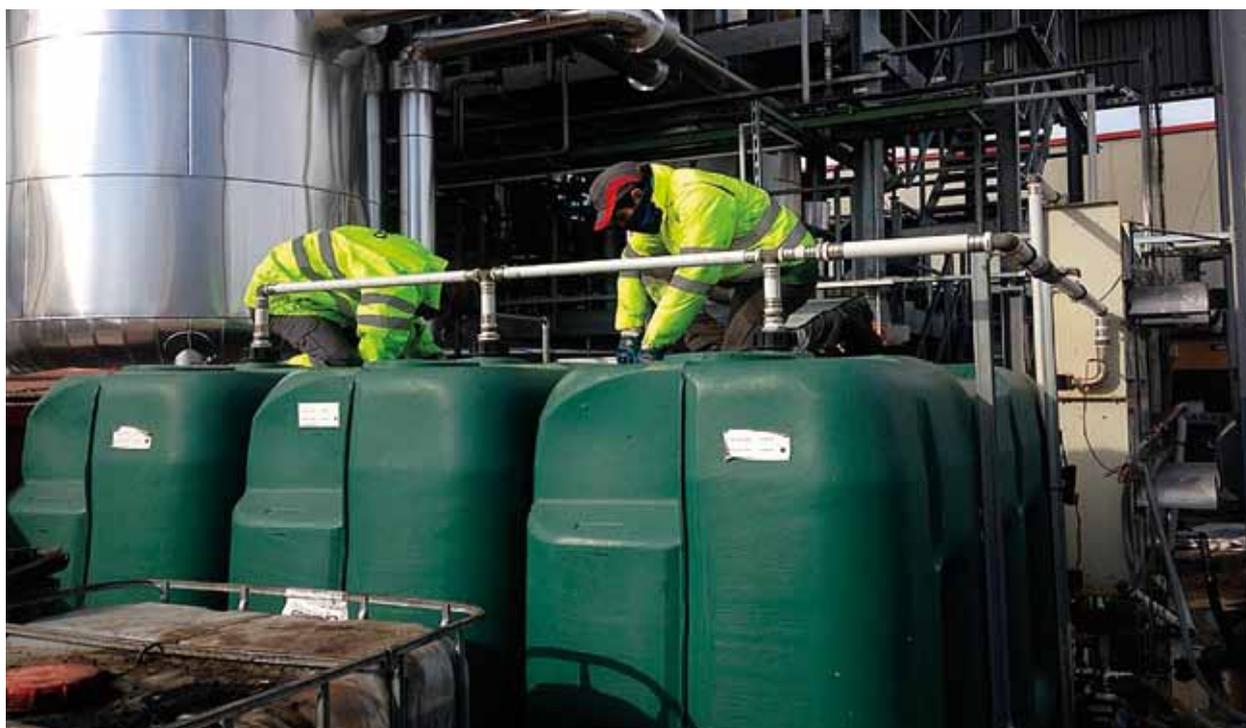
“We have proven that the technology works,” says Mr Ramírez, “now we want to have continuous production of 2 000 litres/hour.” There are several technical obstacles to overcome before this level can be reached, but Griñó Ecologic is confident of achieving its goal. When running continuously, the plant will produce 11 000 m³/yr of synthetic diesel, or 15 000 tonnes/yr of alternative fuel, which implies a reduction of 44 000 tonnes of CO₂. It will also cut the amount of waste sent to landfill each year by 40 000 tonnes.

Aiming for self-sufficiency

The diesel produced is used to generate electricity for the Constantí site’s waste treatment plant, which handles municipal waste from Baix Penedès, Tarragonès and Alt Camp. Griñó Ecologic still purchases some electricity, but would like to be self-sufficient in future by scaling up the pilot plant; the company is considering building a larger DieselR facility at the site, if it can acquire the adjacent land required.

Ultimately, Griñó Ecologic also plans to use the synthetic diesel to power its own fleet of 130 lorries, which transport waste and recovered materials to and from the Constantí site. It has carried out tests on the fuel and found it to be suitable for vehicles. However, the company must first adapt the diesel to comply with European legislation, as well as increasing production levels before using the fuel in its trucks. Tests have found the diesel to be suitable for heating purposes as well, although there are no plans at present to use it for this purpose.

The fuel produced, DieselR, generates electricity for the site’s waste treatment plant





DieselR already complies with the national decree which sets the specifications for petrol, diesel, fuel oil and liquefied petroleum gases as well as the use of biofuels (Royal Decree 1700/2003). This decree transposes the EU Fuel Quality Directive (98/70/EC), which sets limits at European level of sulphur and lead in order to reduce air pollution.

“DieselR is a very good product,” says Mr Ramírez. “We need to make some improvements to the plant in order to increase production, but I am very proud of the amount of diesel we are already making and its quality. We have achieved a very good result.”

Communicating and replicating success

Dissemination and promotion of the DieselR technology was an important part of the project. The beneficiary and partners carried out an ambitious outreach campaign to promote the advantages of the new technology compared to existing practices, in order to encourage replication. More than 300 people visited the pilot facility during the project’s lifetime, including representatives from various public authorities, technicians from international companies and schoolchildren. The project has featured in

local, national and trade publications, as well as in international and digital media. Griñó Ecologic also set up a website - www.dieselr.com - to promote the project and the technology.

Continuing this work is a key objective. Griñó Ecologic aims to intensify contact with several companies that are interested in the DieselR technology, by holding technical sessions and demonstrations for them at the plant. On top of that, it plans to establish contact with more public authorities to organise technical seminars and visits by waste management technicians, in order to spread the project technology even further.

The DieselR technology has great potential for replication due to its environmental, economic and social benefits. The principle behind it - catalytic depolymerisation - can be used in any industrial application that generates non-recyclable organic waste.

Griñó Ecologic is keen to build more DieselR plants at its site in Constanti. “They are modular and take up little space so they can be installed easily,” notes Mr Ramírez. The company is also open to supporting or building plants elsewhere in Spain, or in another EU Member State.

A sample of DieselR, the synthetic diesel fuel produced from waste fractions



Photo: NEEEMO EEIG/Dimas Ramos

Project number: LIFE09 ENV/ES/000484

Title: DEMONSTRATION OF KDV TECH - First Implementation Of A New Waste Recovery Technology Converting The MSW From A Representative Urban Region Into Synthetic Diesel Fuel

Beneficiary: Griñó Ecologic

Contact: Fernando Perez

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Website: www.dieselr.com/

Period: 01-Oct-2010 to 31-Dec-2013

Total budget: €4 872 000

LIFE contribution: €2 338 000



Italy: Adapting water management to a changing climate

The WIZ project developed and demonstrated an innovative approach to drinking water management, which takes into account the predicted impacts of climate change. The approach involves water resource allocation with respect to demand trends and expected resource availability.

Climate change predictions point to an increasing frequency and severity of extreme weather conditions. In southern Europe, a major challenge is to safeguard clean water supplies where they are threatened by climate change impacts, such as water scarcity and reduced water quality, acting alongside the pressures of an increasing population and expanding urbanisation. Long-term adaptation policies therefore need to be developed to ensure available water resources continue to meet the demands of businesses and households. This is best achieved through a water management planning and governance process that can accurately predict needs and availability of clean water, with respect to urban growth and climate change scenarios, and which involves all the relevant stakeholders, especially local authorities and citizens.

The aim of the WIZ project (**LIFE09 ENV/IT/000056**) was to integrate sustainable water management methods into the urban planning process and to raise awareness about water management issues. It did this by developing a platform with a modelling tool and interactive tools to inform decision-making by planners and water consumers. The WIZ concept was introduced into the decision-making practices of 10 pilot municipalities in Tuscany (Italy), and two in Galicia (Spain – see box).

“The main objective was to give the local planners a tool that would allow them to plan urban development based on a clear knowledge of sustainable water availability,” says Roberto Cecchini of coordinating beneficiary Acque SpA. The end result is a platform useful not only to experts and planners,

WIZ integrated sustainable water management methods into the urban planning process



but “which is accessible to all citizens or companies in order to determine water availability in the territory over a certain period of time,” he explains.

The innovative WIZ tools

The project team developed two service tools for its on-line platform: WIZ4ALL and WIZ4Planners. “The first is for citizens, where they can access information on available sources of water in the area,” says project manager Oberdan Cei. “For example, if someone were to buy a house, how will they know that they won’t suffer from water scarcity issues in the future? Thanks to the WIZ services, every citizen can find information about current and future water availability in a specific location.” WIZ4ALL is a free online service that also enables registered users to contribute, by reporting the perceived quality of water in their area, or any malfunctions in the supply system.

The other service is for planners. “When an urban planner has to take a decision or to see what impact a plan will have on the water network, then the platform holds all the information,” explains Mr Cei. “The database enables the planner to very easily choose the type of development that will be carried out on the territory, such as a hotel or a block of flats, and to see how this affects the water network today, and to project the effects of the development on water resources in the next 30, 60 or 90 years, taking into account climate change and other pressures.”

The WIZ4Planners system gives authorities concrete data on which to base decisions, allows comparable data to be shared, and helps to build capacity within local authorities. “We trained [the planners], but they also participated actively by giving us the requirements which form the basis of the platform. It was very interesting to have been a witness to this dialogue between local planners and the scientific community,” adds Mr Cei. Authorised and registered users have free access to WIZ4PLANNERS via the web.

The WIZ tools therefore facilitate the adaptations needed to ensure future water availability, by facilitating informed urban and territorial planning decisions, and through the life choices made by citizens.

The Italian experience

In the 10 Italian municipalities, the entire water network systems were digitised. “Geo-referencing all the water meters in the territory was important, because we now have real-time data when before there were estimates,” explains Mr Cei. “To have all the data on the meters in the tool is important because it allows us to understand present demand and pressure on water resources, enabling us to make more



One of the WIZ project's noticeboards

realistic predictions for the future in terms of water stress and enlargements of the water network,” he says.

Participating municipalities ranged from those in mountainous areas to cities such as Pisa. Giulio Mangani of the Municipality of Montespertoli, where water scarcity is an issue because it cannot be supplied from another network, says the WIZ tools helped the local authority understand how much water is available in the territory, and to adopt measures, such as rainwater harvesting, in structural planning processes. He adds that the municipality’s urban planners use the tool on a daily basis.

The Mayor of Bientina says that the project helped the town understand its particular issue of subsidence: “We understood that although there was high water availability, our aquifer was not secure,” he explains. Bientina feeds into the water network of other municipalities with scarcity issues. Bientina’s citizens were initially resistant to the notion that they had to use water – a resource they had always consumed without limits, in a more rational way. The Mayor says the WIZ project has helped educate them on water scarcity and security issues. “The modelling tool allows us to explain and support our decisions, based on scientific data rather than short-term political choices, and has helped with capacity building enormously,” he concludes.

An important outcome, according to Mr Cei, was that municipalities found out about the structural limits in their water supply networks, and whether they are sufficient to meet expected future demand.



The WIZ experience in Spain

Unlike in the Italian pilot areas, there have been severe droughts in Galicia. Water scarcity is an issue in the village of Baiona, for instance, because of high demand for drinking water from tourism and climate change impacts. "We adapted and implemented the WIZ platform with the help of our Italian colleagues, but our problems were different," explains Juan Sobreira of the Galician Institute of Technology. For instance, whereas Pisa had a lot of data already, "we had to carry out all the mapping of the network to feed into the modelling tool," he says.

Mr Sobreira notes that the project "adopted strong communication campaigns in the area of Baiona, where the citizens have an application which informs them how many days of water availability they have left in their area." This real-time information is important, as citizens must actively participate in water-saving activities in the

area. The project has increased the flow of information from public entities to water basin managers and citizens, says Mr Sobreira.

Eugenio Marcote, an industrial engineer, believes the application of WIZ's GIS modelling system has helped define good strategies for both data collection and water treatment, and built strategic and technical capacity to improve water management. Mr Sobreira adds that it provides valuable information about how much water is available, its quality and the supply network. Other benefits are that it brings stakeholders together around a common objective and enables planners to predict the impact of climate change scenarios on water availability. They both think that the project has raised awareness of water scarcity issues and has shown the value of user-friendly web-based decision-support and information systems.

Information flow is key

Damasco Morelli of the Arno River Basin Authority says that WIZ was important in improving the dialogue with planners, thereby involving river basin authorities earlier in development projects. "Pisa is interconnected with other water sources and aquifers, so there will not be issues of water scarcity. The ones that may suffer are the municipalities that are not connected to other aquifers or networks. However, this doesn't mean that there are not issues of water security, and this can be worked out by using the WIZ tool," he says. "With this system we can give an immediate answer, and the municipality knows how much

water will be consumed, how much a development will impact the water network, if network enlargements must be done, and how much they will cost."

The WIZ tools are also helping the river basin authority mainstream climate adaptation into its River Basin Management Plan, addressing the water quantity and scarcity issues foreseen by the Water Framework Directive (WFD – 2000/60/EC).

Mr Cei believes that the success of WIZ stems from bringing together the people with relevant data and the people who needed that data. The project responded to the needs of municipalities, by providing the scientific data that urban planners need to take decisions and river basin authorities need to ensure sustainable water use. The project's approach has been enthusiastically taken up by other river management authorities. "Both in Italy and in Spain, more municipalities have adhered to the project and are now using the WIZ tools, I think more than 100 for Italy," concludes Mr Cei.

The WIZ team receives the Best award at Green Week 2015



Photo: EC - Patrick Mascart

Project number: LIFE09 ENV/IT/000056

Title: WIZ - WaterZe spatial planning: encompass future drinkwater management conditions to adapt to climate change

Beneficiary: Acque S.p.A.

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Website: <http://www.wiz-life.eu>

Period: 01-Sept-2010 to 30-Aug-2013

Total budget: €1 897 000

LIFE contribution: €942 000



Italy: Managing the nitrogen cycle on livestock farms to improve water quality

The AQUA project demonstrated methods to improve the overall nitrogen balance of farms, including low protein animal feed and techniques for slurry processing and distribution. Results have delivered environmental, agronomic and economic benefits.



In dairy cows, an optimal balance of dietary amino acids reduces the amount of nitrogen excreted whilst improving milk quality and cow fertility

Intensive livestock farming contributes to excessive levels of nutrients such as nitrogen and phosphorus in the environment. Of particular concern are ammonia and nitrates; the latter being highly soluble, toxic in small quantities and a threat to water quality. The Nitrates Directive (91/676/EEC) therefore placed upper limits on the amount of nitrogen from livestock manure that can be distributed on farms, specifically, 170 kg/ha in 'vulnerable zones' such as fields located near rivers.

The AQUA project (**LIFE09 ENV/IT/000208**) demonstrated innovative technical and management practices to help farmers achieve a better nitrogen balance on their land, to improve environmental performance with no loss of productivity. "The project had two main objectives," says project manager Marco Ligabue. "The first was to change the diets of pigs and cows to reduce the amount of nitrogen excreted

by livestock, and the second was to introduce new practices concerning the use of animal slurry in the field."

The project demonstrated its methods on 12 livestock farms in northern Italy, with results that are applicable to livestock farms throughout Europe.

Feed protein: quality not quantity

AQUA was led by coordinating beneficiary CPRA (Emilia-Romagna), in collaboration with FCSR (CPRA's research foundation), CRA (Italian Agricultural Research Council), and regional partners IPLA (Piedmont), ERSAP (Lombardy), Veneto Agricoltura, and ERSA (Friuli Venezia Giulia). At CRA's research station near Modena, Giacinto Della Casa explains how the project reduced dietary protein quantity without reducing meat





or milk productivity: “Plant proteins are not ideal for pigs, and feed made from cereal, soybean or sunflower always has an excess of protein; so we are moving toward dietary protein that resembles as closely as possible the protein of the pig. We can reduce crude protein and use synthetic amino acids instead to satisfy dietary requirements and obtain a better transformation of dietary nitrogen into pig nitrogen.” On the four pig demonstration farms, this project action reduced the amount of nitrogen excreted in a year by around 10%.

On the farm that Paolo Zambelli owns with his brother Davide, pigs are fattened for PDO (Protected Designation of Origin) Parma ham under strict conditions. A computer system monitors dietary components, including grain maize grown and dried on the farm. Mr Zambelli was initially worried that reducing dietary protein would reduce meat yields. Dietary modifications were therefore introduced slowly. After three years, a reduction in crude protein content (14.3 to 13.3%) had not changed meat productivity, but had resulted in a 1.5 kg/year reduction in nitrogen being excreted per pig fattening place. “This has environment benefits and we cut production costs by not buying as much expensive feed,” says Mr Zambelli. “We will continue to use a lower-nitrogen diet, but it is necessary to have continual monitoring of productivity.”

Dr Della Casa notes that if protein is reduced further in diets, the quality of cured hams (e.g. marbling, hardness of fat) will need to be monitored. He also stresses that, “you cannot reduce the amount of crude protein without the use of synthetic amino acid, so you will need a large-scale production of amino acids at lower cost to achieve EU policy objectives.”

Dairy and beef cattle are different to pigs in that they are ruminants; so the aim is not to reduce the protein content of the diet as much, but to stimulate the ruminal microflora through an optimal balance of dietary amino acids (most crucially lysine and

The project used buffer strips, controlled drainage and constructed wetlands to reduce nutrient losses from the soil



methionine). This reduces the amount of nitrogen excreted, and also uric acid levels in milk, blood and urine. In dairy cows this gives better quality milk, reduces emissions of ammonia, and increases cow fertility. The situation for beef is more complicated, being dependent on the breed and the quality of locally-produced hay, so it is linked to single farm solutions.

Although the project’s results are more variable for cattle, and not as pronounced as for pigs, reductions in dietary protein were shown to generally increase nitrogen use efficiency.

Improvements in feed efficiency mean that a greater percentage of nitrogen brought onto the farm is transformed into meat or milk; so there is less nitrogen in manure and slurry, and less leaves the farm in the form of leaching and runoff that can reduce water quality.

Making the most of slurry

The application of manure and slurry (liquid manure) to farmland as fertiliser can result in excessive nutrient loads, so a fertiliser that is lower in nitrogen can help reduce the economic impacts of nitrate legislation and reduce water pollution. The AQUA project further addressed this by moving nitrogen-rich solid manure fractions off livestock farms, which turned a potential problem into a resource, and through innovative distribution methods for all types of slurry.

“This is the mobile solid-liquid separator,” points out Paolo Mantovi of FCSR, on the Margherita dairy farm in Lombardy. “It takes raw slurry that has been mixed during its storage to have a homogenous consistency, and turns it into clarified liquid slurry, for use on the farm as fertiliser, and a solid fraction that is transported to organic farms or to biogas plants.”

The mobile unit is owned by the San Lorenzo cooperative of dairy farmers and is moved between 15 of those farms (the other farms in the cooperative have permanent separators). “We use the separator once a month, for four or five days at a time,” explains Alessandro Gandolfi, the co-owner of the Margherita farm, where milk is used to produce PDO Parmigiano-Reggiano cheese. “Before we used the separator, slurry built up and was more difficult to manage. Now it is an essential tool to manage slurry that is better from the agronomic and environmental point of view.”

Dr Mantovi notes that an important result of the project was that it helped farmers and biogas plant operators to set up a consortium. This has increased demand for the separator. “The solid fraction is produced at a rate of around 5 tonnes per hour, with on average 4 kg nitrogen per tonne,” he explains, adding that, “this is making an important contribution to helping farmers implement the Nitrates Directive, as a separator at a farm for four days, working 12 hours a day, can concentrate the ni-



Photo: CRPA

The mobile solid-liquid separator that creates clarified liquid slurry and dry fractions

trogen load equivalent of 5 to 6 ha of farmland in vulnerable zones. Instead, this solid material can be taken to farms where nitrogen is not a problem and is in demand to increase crop yields.” The solid fraction has a value of around €8-10/tonne as an organic fertiliser or biogas substrate, which pays for the separating operation on dairy farms.

“The biogas plant is a step in the middle, which was added during the last year of the project, to add further value to the solid fraction to produce renewable energy,” explains Dr Mantovi. “The digestate generated after biogas production is used as a fertiliser.” Biogas operators are keen to use the solid fraction to diversify the available substrate, as conflicts with animal feed usage mean that maize silage has become less favourable for bioenergy production.

The clarified liquid slurry fraction is cleaner than raw slurry. Therefore, it is easier to pump and can be used in irrigation systems to increase the efficiency of nitrogen utilisation, in a process known as ‘fertigation’, or it can be distributed as an alternative to chemical fertilisers.

On the Zambelli pig farm, for example, liquid manure has saved money previously spent on chemical fertilisers. “We continue to use liquid slurry post-AQUA, but to an extent depending on the weather. In a wet spring, it is difficult to spread slurry and easier to spread chemical fertiliser. However, when dry, slurry spraying is better because of the double benefit of nitrogen and water, whilst chemical fertiliser just sits on the soil surface,” says Mr Zambelli.

“We focused on the best possible time of season for liquid slurry use, when the crops need nitrogen and phosphorus,” says Dr

Ligabue. “Another practice was to drill into the soil, rather than let it stay on the surface, to avoid the production of ammonia in the air.” The project also demonstrated complementary agri-environmental measures, including buffer strips and wetland construction to remove nitrates (through plant absorption and microbial breakdown) before they can contaminate surface waters or aquifers.

Two tools on the AQUA website help farmers calculate nitrogen balances and store data for managing organic matter on farms. “Calcola-N is a tool that allows farmers to understand how much nitrogen they introduce on their farms and how much of this nitrogen their animals excrete,” explains Dr Ligabue.

“We have demonstrated techniques useful for increasing the efficiency of nitrogen use at the farm scale, with environmental benefits and reduced economic costs,” concludes Dr Ligabue, “and the results don’t finish with the project, because the practices continue to be applied on an increasing number of farms.”

Project number: LIFE09 ENV/IT/000208

Title: AQUA - Achieving good water Quality status in intensive Animal production areas

Beneficiary: Centro Ricerche Produzioni Animali - C.R.P.A. S.p.A.

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Period: 01-Oct-2010 to 31-Mar-2014

Total budget: €2 635 000

LIFE contribution: €1 311 000



UK: Connecting Europe's river restoration professionals

RESTORE held 66 events, enabling knowledge of river restoration to be shared with more than 10 000 river management practitioners across Europe. The RiverWiki the project developed contains around 1 000 restoration case studies from 31 countries.



Photo: Olli Toivonen

Restoration works on the River Vantaa in Finland

According to LIFE project RESTORE (LIFE09 INF/UK/000032), river restoration is “a variety of ecological, physical, spatial, and management measures [...] aimed at restoring a more natural state and functioning of the river system in support of biodiversity, recreation, flood management and landscape development”. Flood protection, navigation, wa-

ter supply and hydropower projects implemented in and around rivers have left less than 20% of Europe's rivers and floodplains in their natural state. In the last few decades people have become increasingly aware of the negative and costly effects of this trend on river ecosystems. As such the option of river restoration has become more and more strongly voiced.

River restoration can improve ecosystems, food supply, wildlife, energy, transport, recreational space, riparian forests, natural floodplains and purification systems (see box). It also often has the potential to transform unattractive urban areas into vibrant environments.. In addition, it supports the implementation of important EU policies such as the the Birds, Habitats, Floods and Water Framework directives.

The idea for RESTORE emerged from the fourth International Conference on River Restoration, which took place in Venice in 2008. "One of the conference's main conclusions was that there was a definite need to share information and experiences better amongst practitioners," explains Martin Janes, Managing Director of the River Restoration Centre (RRC), UK. During a discussion about how this could be achieved the idea of an information-sharing project was considered and actively encouraged by an attending representative of the European Commission.

First connections

RESTORE was a joint project between the Environment Agency (EA), Department for the Environment, Food and Rural Affairs (DEFRA – UK), River Restoration Centre (RRC – UK), Wetlands International WI - the Netherlands), the Government Service for Land and Water (DLG - the Netherlands), Finnish Environment Institute (SYKE) and Italian Centre for River Restoration (CIRF). The EA was the coordinating beneficiary of RESTORE and four regional partners managed the work in different European regions: the RRC was responsible for the western region, SYKE for the north, CIRF for the south and DLG managed the project data and eastern Europe. Last but not least, WI helped with communications. The European Centre for River Restoration (ECRR) played a pivotal role in the project by providing support as an advisory board.

The LIFE project successfully improved knowledge about restoration and encouraged the implementation of more and better restoration measures by:

- Establishing networks to bring together policymakers, river basin planners, practitioners and experts;
- Developing the capacity of national river centres across Europe and helping them to look for examples outside their national borders;
- Helping to ascertain the real barriers and opportunities for river restoration and providing recommendations for the future;
- Building a database on river restoration around Europe to provide professionals with information needed for the most effective restoration of rivers; and
- Explaining the benefits of river restoration and how it can help meet the targets of the EU's Green Infrastructure, Biodiversity 2020 and Water Blueprint strategies.

Making connections by sharing knowledge

At first, the project focused on collecting information about issues that aid or hinder restoration schemes around Europe, existing river restoration networks and on case studies. This provided partners with a firm foundation and enabled them to identify a number of barriers that practitioners seemed to be facing where river restoration was concerned. These included: lack of political will; the need to better engage different sectors such as urban planning and development; and the often seen conflict between hydropower and ecology. Examples were then collected to show how these issues are being addressed and overcome.

"One of the main project challenges was trying to work out the differences in the way practitioners work, the ways river

Benefits of river restoration

RESTORE's publication *Rivers by Design* highlights typical benefits of river restoration to its audience of river management practitioners. These include:

- Improved flood management and drainage techniques;
- Improved water and soil quality;
- Improved biodiversity;
- Revitalised urban environment, open spaces and more attractive water environment;
- Opportunities for education and informal learning about the environment;
- A positive impact on peoples' health and well-being;
- Solutions to tackle climate change and provide green infrastructure;
- An improved the river corridor and green space networks;
- Increased access to nature and recreation; and
- Improved sustainable transport.

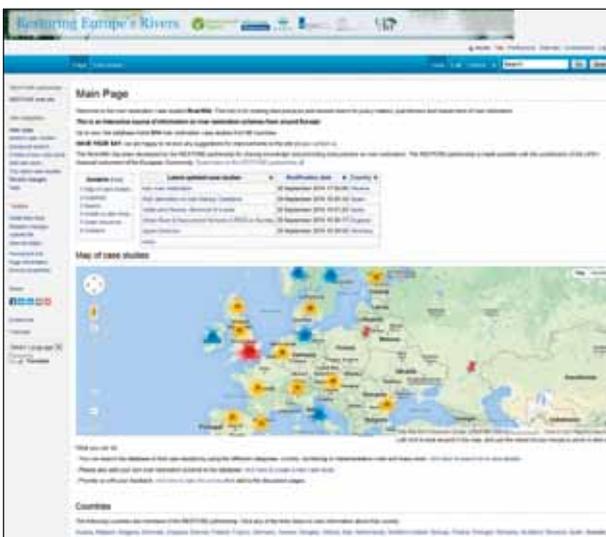


restoration is perceived and where the focus currently lies in each country and then finding a way to present materials that worked for everyone,” Ms Sheahan recalls. River restoration and management were distilled into a number of themes. These themes are often the starting point or initial focus for what is in fact a wider river restoration and management issue. This provides a route into the website, a focal point, and makes it easier to navigate for the various target groups and their varying perspectives on the topic.

RESTORE targeted professionals working in a variety of disciplines connected with river restoration. It also worked with professionals in urban planning, architecture and policymaking and development. In total, the project organised 38 events in eight European countries for a variety of audiences and participated in a further 28 events across the EU. “We targeted conservation and environmental specialists, planners, landscape architects, contractors, consultants, flood risk engineers, government officials, scientists and policymakers,” says Mr Janes.

Ms Sheahan explains that the project would have liked to reach more professionals in the development sector such as architects and planners. “We were able to make some good connections with those sectors but would have benefitted from more time to develop our contacts and knowledge. When we did reach them, however, the feedback was always really positive,” she comments. Both Ms Sheahan and Mr Janes remember a boat trip on the River Thames aimed at London’s key planning and architecture policymakers as being a particular success. “In fact, field trips were really well received because they showed people real examples of river restoration and, in turn, provided a tangible link to what we were trying to do with the RiverWiki tool,” says Mr Janes.

RiverWiki is an online tool that enables practitioners to access case studies on river restoration from all over the world



RiverWiki is an online tool that enables practitioners around the world to access a large number of detailed case studies on river restoration. It is an interactive source of information with a focus on lessons learnt and best practice examples. People managing restoration projects are able to input details about their projects and these can then be viewed by practitioners looking to implement similar activities. “The ultimate aim is to make RiverWiki the best available tool for information on river restoration,” says Mr Janes. This would mean that RiverWiki could continue to grow in the future through its reputation with minimal active management.

Continuing to make connections

RESTORE enabled river management practitioners across Europe to gain a broader view of river management and allowed them to start looking outside their own countries for project examples and ideas. “It made people aware that there are others experiencing similar issues elsewhere,” enthuses Mr Janes. The results of the project have now, in fact, been taken beyond the EU’s borders: At the final project conference a “Community of Practice” agreement was created. Here, EU countries with more experience in river restoration signed up to help EU candidate countries with their river management. In addition, RiverWiki has expanded to include project examples from the USA, Canada and Brazil.

“The information produced during the project is still being used and if anything has become even more useful since the project ended because the subject matter is more and more relevant,” points out Mr Janes. Project partners hope that further funds will be made available to keep networking events and the ERRC running. They would also like RiverWiki to be self-supporting in a few years’ time when funding runs out. In order to maintain and develop the benefits of the networks and partnerships established during the project, however, future initiatives are needed to continue to raise awareness about river restoration and to integrate it into policy at all levels and across all sectors.

Project number: LIFE09 INF/UK/000032

Title: RESTORE – RESTORE – Rivers: Engaging, Supporting and Transferring knOwledge for Restoration in Europe

Beneficiary: Environment Agency for England

Contact: George Gerring

Email: george.gerring@environment-agency.gov.uk

Website: www.ecrr.org/

Period: 01-Sept-2010 to 31-Dec-2013

Total budget: €1 795 000

LIFE contribution: €873 000



Slovenia: Educating the next generation about e-waste

The Slovenia WEEE campaign raised awareness amongst young Slovenians of the importance of correct treatment of electrical and electronic waste.



The project raised awareness on e-waste among children

Waste electrical and electronic equipment (WEEE) is one of the fastest growing waste streams in the EU, making up about 4% of municipal waste. If not collected separately and treated properly, WEEE ends up in landfills, potentially even wild (i.e. unauthorised) landfills, where the hazardous materials it contains produce negative effects on the environment and health. Slovenia introduced the systematic collection and treatment of WEEE in 2007. Similar to many other Member States, the country's citizens today have many options to choose from to get rid of their waste batteries, light bulbs, communication and entertainment devices, and household appliances.

In addition to municipalities' public collection centres, there exists a network of 45 additional collection centres all over Slovenia, run by project coordinator ZEOS, a national non-

profit partnership for the management of WEEE, and its partners. Alternatively, consumers can return devices to retailers or – depending on the quantity of WEEE – they can ask for the waste to be picked up directly, although this mostly applies to companies, schools and other large organisations.

Changing children's minds

The average Slovenian citizen used to know little of these possibilities and the importance of managing e-waste. ZEOS therefore launched the Slovenia WEEE campaign (**LIFE10 INF/SI/000139**), a LIFE Information & Communication project designed to spread the word about the collection and treatment of this waste stream. The campaign focused on households and – most importantly – schoolchildren. Educating the young, the project team thought, would achieve



the best results and hopefully generate positive multiplier effects.

To engage this target audience – mostly 10 to 11 year-old children – the project built the E-Transformer, a lorry filled to the brim with multimedia content and other exhibits to illustrate how e-waste should be collected and treated properly. To make the vehicle more environmentally friendly, it has its own solar panel array installed on the roof, which feeds solar energy to a battery situated behind the driver's cab, which in turn provides electricity for the multitude of devices on board. It was the project's most valuable tool, all those involved agree. Without it, the campaign would not have been as successful.

"The feedback from the schools and teachers was really good," says project action manager Branka Biček Bizant of ZEOS. "They were really excited about the E-Transformer. And so were the children! It offers a different approach to education."

The E-Transformer experience

The lorry visited over 200 schools during the project's runtime; in just one year, more than 66 000 children climbed on board for the E-Transformer experience. Situated in central Slovenia, just south of the capital Ljubljana, Škofljica School with a student body of more than 1 000 was one of the institutes participating in the project. Its students are living proof that the E-Transformer with its child-oriented, colourful design hits the spot!

When the children are in the specially devised cargo area of the lorry, they are completely immersed in the exhibition, watching a film that explains the details of WEEE collection

The E-Transformer lorry illustrates how e-waste should be collected and treated properly



and treatment. Then they scrutinise a disassembled washing machine, LCD monitors, mobile phones and other electrical appliances, observing the internal workings of these everyday objects and learning about their hazardous and non-hazardous components. Other children play Zetris, a specially designed Tetris-like puzzle video game in which the player has to sort batteries, light bulbs and small electronic devices into the correct e-waste containers.

"If we leave e-waste in nature, it is harmful for the environment," explains one little boy afterwards. When asked whether they will make sure to collect WEEE separately in the future, he and his classmates reply with a resounding "yes!".

Several classes answered a survey before and after visiting the E-Transformer, which demonstrated the benefit of the experience rather clearly: although the students were quite well informed and aware of the issue before the visit, the E-Transformer gave them a better idea of how the entire WEEE collection and treatment process actually works, much to their appreciation.

Collection efforts continue

Environmental awareness had already been part of Škofljica School's syllabus and separate waste collection was not a novelty either. However, the school intensified its efforts during and after the campaign: lessons were enriched with information about WEEE. Students were motivated to come up with ways to contribute to the matter themselves and shot a film based on their own experiences and what they had learnt, as well as making posters and t-shirts. The film, which was the pupils' own initiative, even won an award.

As in the other participating schools, the project set up small containers for WEEE collection, which are still in use. In addition, larger quantities of e-waste and large appliances are picked up once or twice a year.

"People like things to be easy," explains headmaster Roman Brunšek. "If you can do two things at once – like taking your child to school and getting rid of your old TV set in the proper way in one fell swoop – that will increase your motivation. The easier we make this, the more people will do it."

To raise further awareness of proper disposal routes, the project team also collected 267 interactive computer touchscreen terminals from hospitals and community healthcare centres. The terminals had originally been used for health insurance information, but had become obsolete. Around 80 of the terminals were refurbished and fitted with an interactive quiz and other educational material and given to schools participating in the LIFE project to support their educational activities.

The elements of success

Whilst the fruitful collaboration with the schools was one of the main elements of success, the project's work went far beyond this. For instance, the team organised open days at local collection centres; it also held a conference to present the project's achievements to experts from 11 EU countries as well as the general public. All in all, events carried out in the framework of the WEEE campaign covered 89 of Slovenia's 200 municipalities, reaching more than half of the country's population. Prize competitions, intensive social media activities, and media coverage that exceeded expectations did their part to raise additional interest. In total, the project helped collect more than 540 tonnes of WEEE.

Igor Petek of the Ljubljana-based municipal waste management company SNAGA was one of five members of the project's steering committee. "It is clear to see that e-waste separation is improving," he says, adding that the campaign surely contributed to this upward trend. "In addition, let's not forget that any such campaign also has an impact on other types of waste," Mr Petek points out. "There are synergies, so that a campaign raising awareness of e-waste, for instance, will also have an impact on the collection and recycling of other types of waste as well as waste treatment as a whole."

Not the end of the road

Slovenia has one of the highest waste collection and recycling rates in the EU (see box). WEEE collection, however, could still do with a boost, says Mr Petek, although in 2014 ZEOS managed to collect 44% of the total quantity of electric and electronic devices put on the market in the previous three years.

The WEEE campaign's success is not the end of the story: the ZEOS team continues the work begun during the project, albeit on a much smaller scale. The project website is still up and running for those looking for information on WEEE collection and treatment. The team is also still active on social media. In addition, the collection containers have remained in the schools and are emptied as needed.

More importantly, though, the E-Transformer is still out on the road, travelling the country and beyond to inform even more people about the importance of the WEEE issue, which, according to ZEOS's Emil Šehić, who managed the project as a whole, is a societal obligation. Beside Slovenia, the lorry has been to Bosnia and Herzegovina, visiting schools and collecting e-waste. What is more, in the spirit of best practice exchange, the Slovenia WEEE campaign collaborated with the LIFE ECOTIC project in Romania, where the ECOTIC Caravan is now spreading the word about WEEE.

Recycling and composting: Slovenia top of the class

When it comes to separate waste collection and recycling in general, Slovenia is among the best performing countries in Europe. According to Eurostat, Slovenia generated 414 kg of municipal waste per person in 2013 – significantly lower than the EU average of 481 kg. Some 62% of the Slovenian waste went on to be recycled (55%) and composted (7%). Significantly, the recycling rate has increased 15 percentage points (up from 47%) since 2012. This is significantly better than the EU average municipal waste recycling and composting rate of 43%.



Photo: NEEMO EEG/Kristen Hegginer

"Our organisation is always busy with awareness-raising activities in some shape or form," says Mr Šehić. "However, without support from the outside, we cannot be quite as active as during the project, i.e. cover the whole country and respond to all the needs of the schools."

He emphasises that the quality of awareness-raising campaigns is often intrinsically linked to the availability of funds. "Hence, without LIFE support, we would not have been able to do what we did, and probably today's WEEE collection rates would not be as high as they are now."

Project number: LIFE10 INF/SI/000139

Title: Slovenia WEEE campaign – Raising awareness of the importance of environmentally sound management of WEEE among identified target groups in Slovenia

Beneficiary: ZEOS, ravnanje z električno in elektronsko opremo, d.o.o.

Contact: Emil Šehić

Email: Emil.Sehic@zeos.si

Website: <http://life.zeos.si/en/home.html>

Period: 01-Oct-2011 to 01-Oct-2013

Total budget: €584 000

LIFE contribution: €284 000





BEST LIFE ENVIRONMENT PROJECTS

BEST PROJECTS

Greece: Protecting soil from olive mill waste

The PROSODOL project developed an integrated approach to the disposal of olive mill waste on agricultural soil, optimising a set of soil indicators and threshold values. It also established a GIS system for assessing risk and software to monitor soil quality.



A discharge site of olive mill waste causing water pollution

The disposal of olive mill waste (OMW) is a widely acknowledged environmental challenge. The polyphe-nols found in OWM pose a serious threat and safe disposal of the waste can be costly, especially for small domestic mills. Many LIFE projects had thus sought to find cost-effective solutions to OMW in order to protect soil but none had sought to restore contaminated sites.

The project, PROSODOL (LIFE07 ENV/GR/000280), however, was particularly successful in developing low-cost methods of soil remediation and protection, namely bioremediation (a process whereby organic wastes are biologically degraded under controlled conditions to an innocuous state) and zeolite application on soil. Though these practices are widespread, they

hadn't previously been applied to OMW disposal areas. The project also evaluated other known soil remediation methods and provided a useful guide on how to select the most appropriate ones. The different methods were applied on a pilot scale at one of the five disposal areas on the island of Crete, in Greece.

Under controlled conditions, young olive trees were then grown in dedicated containers in the Liguria region of Italy. These plants were fertilised with unprocessed OMW wastewaters and the project team then assessed the effect of the OMW on the young trees' growth and yield, as well as the quality of the soil and the potential phytotoxic effect. Guidelines for the agronomic use of olive oil mill waste were produced in English, Greek, Italian and Spanish.

Soil monitoring

The project's soil monitoring system consists of:

- An optimised set of soil quality indicators;
- Threshold values for soil quality indicators;
- A system to facilitate decision-making on the most appropriate areas for OMW disposal;
- A GIS -based tool for the risk assessment of the OMW disposal sites;
- A land application system to ensure the safe disposal, use and application of OMW on soil;
- Software application tools for soil monitoring;
- A web-based GIS application that indicates variations of different soil parameters such as pH, electrical conductivity and polyphenols; and
- An INSPIRE geoportal accessible through the IMS-FORTH web GIS server (www.ims.forth.gr:8080/geoportal).



The project also developed a methodology for co-composting OMW with other agricultural wastes (leftover plant materials, such as organic wastes deriving from vegetable processing and field production, tree bark, gardening wastes, pruning wastes including residues coming from olive trees) and clinoptilolite (a natural zeolite).

Furthermore, the project team developed a low-cost pilot unit for OMW processing on a field scale that can function as a 'treat and use' unit for the owners of disposal areas. The project also developed easy and rapid methods for determining the waste's chemical oxygen demand (COD) and biological oxygen demand (BOD) values at the mill. These values help mill owners to measure these parameters by themselves and manage and dispose of the waste safely.

Other achievements of the PROSODOL project included the assessment of the suitability of using pre-treated waste in the cultivation of lettuce. Treated wastes were also added to the pilot sites after the implementation of the bioremediation. Two treated waste doses, 80m³/ha and 200m³/ha annually, were tested. The experiments were conducted on soil with and without the addition of 5% clinoptilolite. Soil samples were then collected and analysed to assess the impact of the treated waste on soil and on lettuce yield and quality. These tests enabled the project to draw up further guidelines for the potential use of waste in crop production based on soil characterisation.

Finally, the project developed a simple software tool for soil quality assessment that permits quick evaluations to be made based on the monitoring results (see box). In order to evaluate the degree of risk in the vicinity of a waste disposal area, the user inserts values of some or all of the pre-defined chemical parameters. The software can be freely downloaded from the project website. The site is also home to a continuously-updated information library.

Informing policy

A major aim of the project was to use the findings of these trials to shape EU policy. As project manager Dr Maria Doula of the Benaki Phytopathological Institute explains, "the project partners presented the results to local stakeholders, and, following discussions, both researchers and stakeholders agreed on the final proposal to the EU regarding measures for olive mill waste disposal areas."

The project hopes that this proposal will be, "incorporated into the EU legislative framework," according to Dr Doula. It is also hoped that national policymakers will adopt the proposed measures and develop strategies for soil protection, monitoring and remediation. "Considering that soil remediation and protection methodologies have never been developed for olive mill wastes areas, this achievement is indeed significant," she says.

Project number: LIFE07 ENV/GR/000280

Title: 'PROSODOL - Strategies to improve and protect soil quality from the disposal of olive mills' wastes in the Mediterranean region'

Beneficiary: Hellenic Agricultural Organization DEMETER

Contact: Maria Doula

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Website: www.prosodol.gr

Period: 01-Jan-2009 to 31-Dec-2012

Total budget: €1 665 000

LIFE contribution: €803 000



Italy: Fuelling hydro-methane powered public transport

MHyBus created the first public bus to run on hydro-methane in Italy. The prototype was tested on more than 45 000 km of road and picked up over 10 000 passengers. Total CO₂ emissions were reduced by 6 tonnes and methane by 1.8 tonnes per year.

Transport is responsible for 32% of total CO₂ emissions in the Emilia-Romagna region of Italy. As a region, it is the second biggest emitter of CO₂ emissions from transport in Italy. The topic of sustainable public transport has been a high priority for a number of years. The region already has a large fleet of public vehicles fuelled by natural gas. Indeed, the city of Ravenna's fleet has been in operation for 20 years.

In 2006, the regional government commissioned the National Agency for New Technologies, Energy and Sustainable Development (ENEA) and the consortium for innovation and technology transfer in Emilia-Romagna (ASTER) to carry out a feasibility study on the use of a methane-hydrogen blend as an alternative fuel for the buses running on natural gas. The study concluded that, given the environmental benefits and the existence of a relatively

simple method of producing hydrogen gas through steam reforming, the region's whole fleet should be converted to run on hydro-methane.

Making public transport more sustainable

Further research showed that the optimum ratio of hydrogen to methane in terms of energy efficiency and pollutant emissions was 15:85. At this point, Regione Emilia-Romagna, ASTER and ENEA, together with additional partners, START Romagna, applied for LIFE co-funding for MHyBus (LIFE07 ENV/IT/000434), a project whose principal aim was to test a hydro-methane bus on public roads for the first time in Italy. "After trying the technology on one bus we hope to open up the technology to the entire fleet of buses," explains Stefano Valentini, project manager at ASTER.

The hydro-methane bus has reduced CO₂ emissions by 6 tonnes

Photo: ASTER



“One of the main challenges was dealing with regulations and obtaining authorisation for the bus,” says Mr Valentini. At the outset of the project there was no legislation in place for hydrogen-methane fuel. After a long negotiation period, the programme was approved by the Ministry of Infrastructure and Transport, subject to a number of rigorous tests to be carried out during implementation. “Rather than despairing the project team decided to use this as an opportunity to add an even more ambitious goal to the project – building a hydro-methane fuelling station,” he adds. The project had to be amended and a new partner found but in the end the station was successfully constructed on the premises of a hydrogen production plant.

“In the end the restrictions actually helped the project,” says Mr Valentini. “The bus was put on the road before the end of the project and the hydro-methane fuel station gave strength to the project and demonstrated the full feasibility of the technology.” The first refuelling took place in June 2012. “We were excited but also slightly nervous at finally being able to experience this long-awaited moment,” recalls Mr Valenti. “The whole team was present and it was a great example of how far a highly motivated and persistent group of people from so many different backgrounds could come.”

During the development of the vehicle, the partners carried out a number of benchmarking tests to ensure the modifications were safe and that they fulfilled the requirements set by the Ministry of Transport. Once the prototype was ready, the project team ran more tests to monitor CO₂, CO, HC and NO_x emissions and hydro-methane consumption both with and without passengers. This ensured that there were no technical issues with the converted systems, as well as providing evidence of environmental benefits. The tests proved that hydro-methane does not hinder the vehicle’s performance. Results from monitoring of fuel consumption and CO₂ emissions showed that both are significantly reduced thanks to the use of hydromethane. Over

Mr Vittorio Cazzola promoting the LIFE funded project



45 000 km, almost 6 tonnes of CO₂ emissions were avoided and 1.8 tonnes of methane saved per year.

The extension of the use of hydromethane to a larger bus fleet could therefore bring strong environmental benefits. But, what are the costs?

A pioneering project

MHyBus is still running well in Ravenna, where operating costs - based on fuel consumption - were calculated at €800-1 000 per vehicle. Although this is higher than for the existing bus fleet it could be partially offset by local or regional policy incentives as part of an overall strategy to increase the sustainability of transport. These can be justified on the grounds that large-scale hydromethane application can lead to considerable savings on the external costs of transport, i.e. those costs caused by the environmental impact of transport but paid by society as a whole. Thus, transferring the technology to the rest of the city’s fleet makes sense from a financial and environmental point of view. “A feasibility study concerning the extension of the technology to another 10 buses is ongoing,” Mr Valentini reports.

There has been national and international interest in the project. Delegations from Lithuania and Korea have been to look at how the bus and fuelling station were developed. They are still in contact with the team as they are interested in implementing similar technology in public transport in their countries. In addition, two new proposals have been developed following the project. One deals with the use of hydro-methane in large bus fleets and the other looks at using liquid natural gas in urban buses.

“MHyBus was a pioneering project paving the way for a whole set of sustainable mobility solutions in Italy, in Europe and beyond,” believes Paolo Ferrecchi, project coordinator and General Director of Mobility in Emilia-Romagna. The project team hopes it will lead to more MHyBuses on the road in the future and greater implementation of alternative fuels in public transport. “In the long term we would like to see mobility patterns shift towards more sustainable choices,” concludes Mr Ferrecchi.

Project number: LIFE07 ENV/IT/000434

Title: MHyBus - Methane and Hydrogen blend for public city transport bus: technical demonstrative application and strategic policy measures

Beneficiary: Regione Emilia-Romagna

Contact: Stefano Valentini

Email: mhybus@aster.it

Website: www.mhybus.eu/

Period: 01-Jan-2009 to 31-Dec-2013

Total budget: €1 323 000

LIFE contribution: €589 000



Spain: Building a 'zero emissions' business park

This project demonstrated how fuel cell and hydrogen technologies can reduce CO₂ emissions in buildings and transport at a business park in Aragon, Spain.

Hydrogen offers a clean alternative to fossil fuels. The energy efficiency of self-generated renewable hydrogen-based systems is 50–60% for fuel cell applications and up to 80% for co-generation systems based on fuel cells, affording considerable energy savings. Buildings can move towards self-sufficiency by using renewable energies and hydrogen technologies. Business parks populated by companies promoting sustainable development have significant potential for implementing greener technologies.

To demonstrate this potential, LIFE+ ZERO-HYTECHPARK (LIFE08 ENV/E/000136) set out to implement fuel cell and hydrogen (FCH) energy solutions at the headquarters of the project beneficiary, the Aragon Hydrogen Foundation, an organisation promoting the development of new hydrogen technologies. Operational results would then be extrapolated to the other buildings in the Walqa Technology Park (Huesca, Aragon) and to business parks in Spain and other countries.

Energy, heating and transport

ZERO-HYTECHPARK introduced a raft of fossil-fuel free energy, heating and transport solutions at the project site. It designed a complete energy accumulation system with hydrogen generated from renewable sources (wind power, solar photovoltaic energy and thermal solar energy). Fuel cells were integrated in the beneficiary's headquarters to decrease dependence on fossil fuels.

A 2.7 kW solar photovoltaic system was installed on the roof of the building to demonstrate the potential of an isolated power 'zero emissions' system for remote locations that allows power to be supplied to areas off the electrical grid. This option represents an alternative to energy generated using diesel fuel contaminants. Instead, electrical energy is stored in a battery bank that provides the offices with four to five days of independent energy. The system also has a 1.2 kW fuel

One of the zero emission hydrogen-fuelled vehicles at the site in Walqa





Photo: Rosa Casbas, Xavier d'Arquer - doblesSTUDIO

E-bikes were made available to those working in the business park

cell powered by hydrogen from the premises, which produces electricity and recharges the batteries. Savings in CO₂ emissions are some 7.4 tonnes/yr.

To power office equipment, the project installed a standalone photovoltaic solar system generating a total of 7 kW of electricity. The panels on the building's roof supply 24% of the annual electricity consumption – reducing the beneficiary's bill by €1 000/yr and CO₂ emissions by an estimated 7.5 tonnes/yr.

The project trialled the use of 'zero emission' hydrogen-fuelled vehicles at the site in Walqa. It converted a battery-powered electric car to a hydrogen fuel cell. This increased time between recharging by 50% and cut the charging time to just 3-4 minutes. A fleet of 20 e-bikes was made available to those working at the business park. Journeys using these pedal-assist vehicles generate none of the CO₂ emissions that a car would. The project also converted a forklift truck to run on a hydrogen fuel cell. This can be recharged in 2-3 minutes, much less time than the electric batteries traditionally used in forklifts. A single charge is sufficient to complete a typical, eight-hour shift. Using this type of forklift, productivity is increased and CO₂ emissions reduced.

Another aspect of the project focused on the development of a cogeneration system based on hydrogen technologies linked to the building's heating system. The prototype combined heat and power technology consists of a fuel cell battery powered by hydrogen. This offers 4 kW of electrical energy and 3.5 kW of usable thermal energy capable of heating the water in a 150 litre tank from 20 °C to 60 °C over a period of two hours. The system yield is 70% (40% electric, 30% thermal and 30% loss). Hot water can be used for domestic purposes, or for heating the building. The main advantage is that the system does not emit pollutants.

Sustaining the success

Results from the project show that by using a combination of these applications, it is possible to meet between 15% and 45% of electricity demand in the park (depending on seasonal variations in consumption). In addition, use of the combined heat and power system resulted in a 20% saving in greenhouse gas emissions. According to Fernando Palacín, managing director of the Hydrogen Foundation, business parks of the future could be "fully sustainable".

Mr Palacín says that the news of LIFE+ ZERO-HYTECHPARK's Best Environment project award was received with, "great enthusiasm," by all the Hydrogen Foundation's staff. "We believe that the success of the project is directly aligned with the capabilities of FCH technologies to be an important part of the future energy sector, and is also thanks to the team's good development work." Following the award, Mr Palacín says the foundation is, "working even harder to continue to develop this environmentally-friendly technology all over Europe."

Project number: LIFE08 ENV/E/000136

Title: Zero emissions using renewable energies and hydrogen technologies in building and sustainable mobility in Technology Parks

Beneficiary: The Hydrogen Foundation, Aragon

Contact: Fernando Palacín

Email: director@hidrogenoaragon.org

Website: <http://zerohytechpark.eu/>

Period: 01-Jan-2010 to 30-Jun-2014

Total budget: €1 408 000

LIFE contribution: €678 000



Italy: Integrating long-term ecosystem research and monitoring in Europe

The EnvEurope project harmonised, streamlined and raised the profile of LTER-Europe, an environmental research network. This improved the value of long-term data on European ecosystems for scientists, policymakers and environmental managers.

Huge amounts of environmental data are collected worldwide. The global Long-Term Ecosystem Research and Monitoring (LTER) network helps scientists and policymakers understand such data.

The LTER-Europe network was created in 2003 by ALTER-Net, a partnership of institutes from 18 European countries involved in biodiversity research. It integrates data from a large number of national LTER networks within many different ecosystem domains. The ecosystem research and monitoring sites were originally established in each country for different purposes, with different methodologies and parameters, resulting in a large amount of very diverse data. Standardising the LTER-Europe network was found to be a complex process.

The EnvEurope LIFE project (**LIFE08 ENV/IT/000399**) was initiated to improve research and monitoring activities within LTER-Europe. EnvEurope worked to establish common information management and the harmonisation of methods and parameters at European scale. As a pilot study, it involved 17 partner organisations, as well as additional external partners, and used information from 67 LTER-Europe sites (around 20% of the total) in 11 countries, with sites encompassing terrestrial, freshwater, transitional and marine ecosystems. Its findings can be applied to the whole network.

The EnvEurope project developed a common set of long-term ecological parameters and measuring protocols for the coordinated collection of data in the field. It investigated scientific hypotheses concerning long-term data analysis using case studies, and it enhanced network design for the delivery of information on LTER-Europe sites and datasets.

Project manager Alessandra Pugnetti, from the coordinating beneficiary ISMAR (the Italian national research council's institute of marine science), highlights a number of tools that were developed during the project. The first of these, the interactive ECOPAR tool, collects together LTER indicators (biotic and abiotic), alongside internationally-established methods, within



Photo: Stazione Zoologica Anton Dohrn, Napoli

The project collected data on underwater Neptune grass (*Posidonia oceanica*) meadows

a conceptual framework of ecosystem integrity. Secondly, the DEIMS tool (the Drupal Ecological Information Management System for managing metadata) delivers search and view information on LTER network sites, datasets and personnel.

Thirdly, the EnvEurope Thesaurus (EnvThes) provides a vocabulary for machine-based retrieval, and is being adopted as the core vocabulary for the global LTER network. Finally, the project established a common reporting format for LTER datasets, and an agreed LTER-Europe data policy.



New ecological indicators were used to monitor lake ecosystems

The project therefore improved LTER-Europe network design and delivered tools for information management, harmonisation and standardisation. “EnvEurope has successfully tackled these requirements within its runtime, leaving a network that is in a much better state than it was four years previously,” explains Dr Pugnetti. “It is more integrated, more active and has greater capacity to deliver and support vital research.”

Under the ecosystem integrity concept, structure and processes are used to describe the state of ecosystems, and the pressures put on them. Ecosystem structures are characterised by biotic diversity (e.g. flora and fauna) and abiotic heterogeneity parameters (e.g. soils, water), whilst processes (e.g. energy and water cycles) are quantified using indicators for inputs, storage and outputs. This approach facilitates the comparison of data across different ecosystem domains, a key challenge that the project overcame, and the ranking of LTER parameters at four levels of relevance.

The conceptual framework was successfully tested with sample data. For this purpose, the project team collected their own data, using a broad range of new and existing parameters and ecological quality indicators, at different scales and for different monitoring intensities. They sampled in locations as varied as sand dunes, underwater Neptune grass (*Posidonia oceanica*) meadows, high altitude lakes, and in snow on mountain sides.

The project’s theoretical case studies focused on long-term data analysis that addressed changes in biogeochemical processes, climate and biodiversity. The project team also assessed ecosystem processes and disturbances, and socio-economic pressures on ecosystem functioning.

Large-scale integration

Dr Pugnetti notes that, thanks to the project, LTER-Europe is ready to cooperate and integrate with large-scale monitoring

schemes, including those involving remote sensing, and also smaller-scale experimental approaches. For instance, at a large scale, a collaborative link was established between LTER-Europe and the Copernicus programme, a joint initiative between the European Commission and the European Space Agency.

EnvEurope has also made an important contribution to the Shared Environment Information System (SEIS), an initiative of the European Commission, EU Member States and the European Environment Agency (EEA), which interconnects national and international databases.

LTER-Europe provides high-quality services for multiple uses, concludes Dr Pugnetti. The improvements made to the LTER-Europe network have strengthened the scientific basis for environmental decision-making, planning and policymaking across Europe. The network facilitates harmonised monitoring within the Natura 2000 network, helping implement the Habitats Directive, and it supports the implementation of the EU 2020 Biodiversity Strategy, the Water Framework Directive and potentially many other areas of EU legislation and policy.

As a result of the EnvEurope project, LTER-Europe is beginning a new phase of development.

Project number: LIFE08 ENV/IT/000399

Title: EnvEurope – Environmental quality and pressures assessment across Europe: the LTER network as an integrated and shared system for ecosystem monitoring

Beneficiary: ISMAR

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Period: 01-Jan-2010 to 31-Dec-2013

Total budget: €6 068 000

LIFE contribution: €3 004 000



Belgium: LIFE aids air quality improvements

Poor air quality affects all EU citizens and influences the wider environment. Improved information about areas suffering from high risk of air pollution can help reduce threats and better manage air quality 'hot spots'.

Poor air quality adversely affects human health, the environment, and the climate. Both short-term and long-term exposure to air pollution harms health. Harm can occur either by direct exposure to air pollutants, or indirectly by pollutants transported through the air, deposited, and then accumulated in the food chain. Pollution from the air also harms ecosystems through acidification and eutrophication of water or soils.

EU air legislation follows a twin-track approach of implementing both local air quality standards and mitigation controls targeting the sources of air pollution. Source-based mitigation controls rely on accurate knowledge of localised air conditions. The LIFE ATMOSYS project (**LIFE09 ENV/BE/000409**) has successfully improved understanding of so-called air quality 'hot spots'.

These hot spots are characterised by markedly higher-than-average atmospheric pollution levels, mostly caused by a high density of human activities. One notable EU hot spot occurs around the Flanders-Randstad-Ruhr region in Belgium. LIFE co-finance was used here with success to establish a generic web-based service that both forecasts localised air pollution problems and assesses management and planning options to reduce potential problems.

The ATMOSYS system explores forecasted as well as historical data records of air pollution, at neighbourhood scale, by means of animated spatial maps, timeline trends, or statistics of relevant air pollution indicators, such as ozone, particulate matter (PM), NO₂, and/or elemental carbon. Regional scale air pollution simulations are combined with high resolution street level models in the project's technology to capture all relevant spatial scales of the air pollution phenomenon.

Comprehensive coverage

In addition to the well-established fixed monitoring network in Belgium, dedicated measurement campaigns were set up in various Flemish cities in order to assess the air quality differences between urban background, urban and street 'canyon' locations. The project applied prognostic 3D atmospheric com-

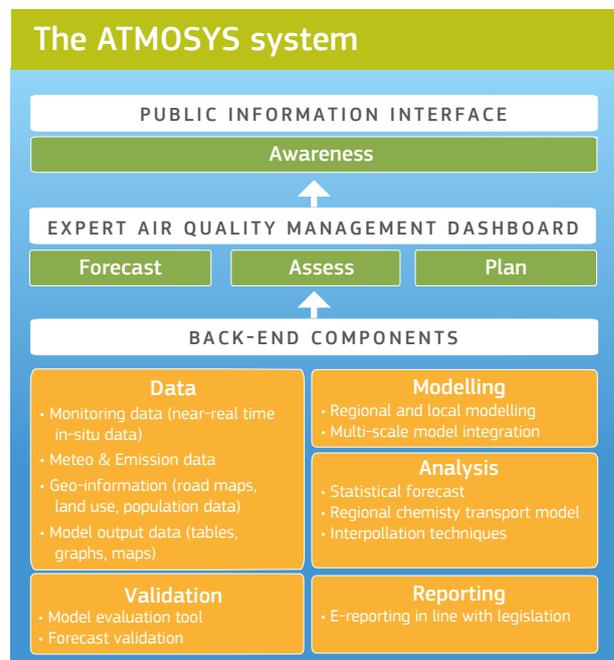
puter models and other advanced techniques to build forecasts based on the near real-time monitoring data. These are available via the web platform, thus offering citizens and policymakers a wealth of useful information about local air pollution.

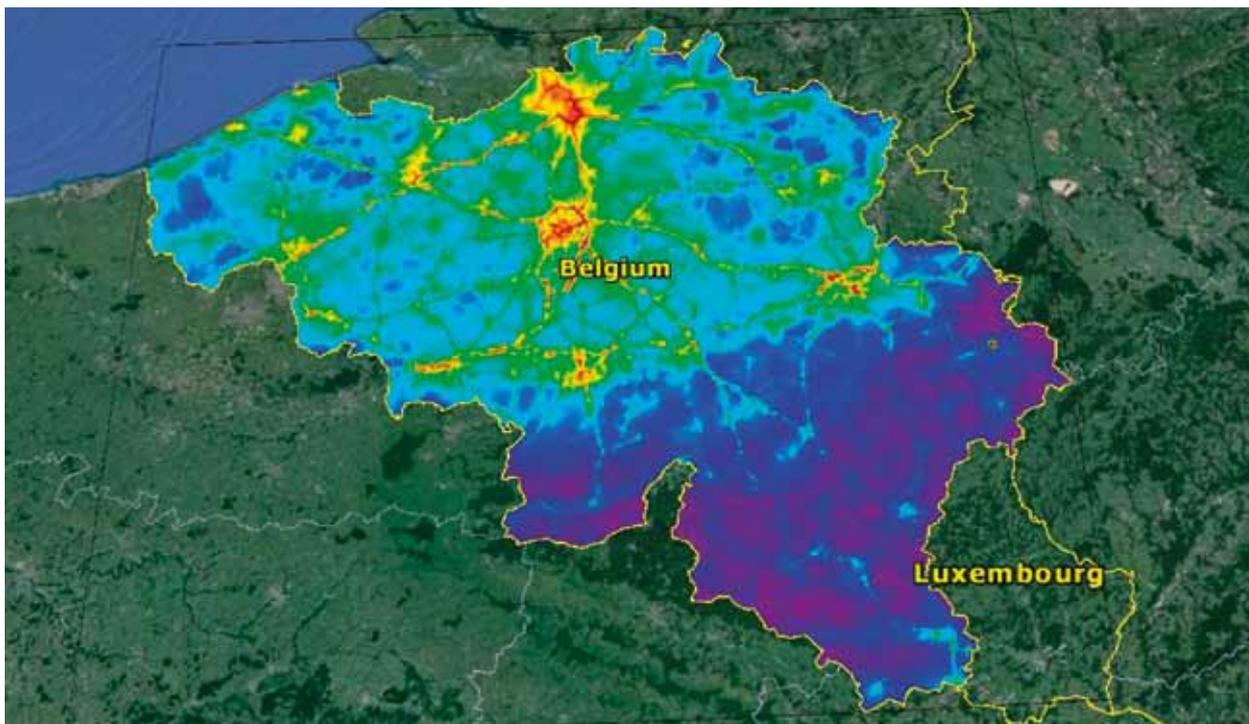
Improved knowhow resulting from the ATMOSYS system is used within innovative street level spatial tools that include the ability to analyse air pollution forecasts (up to three days in advance) as well as provide maps that can model problems associated with human exposure to air pollution.

"The air quality forecasts of ATMOSYS give us new and supplementary information to respond quickly when air pollution thresholds are exceeded," explains Frans Fierens from Belgium's interregional environment agency.

Public awareness

Often the general public are not aware of their role in the air quality problem. By publishing high-resolution maps and





Air quality modelling for Belgium

letting the public explore the ATMOSYS data, this Best LIFE project increased awareness and helped a wide range of people to better understand air quality in their local area. ATMOSYS became headline news in Flanders, where there was a surge of interest from the public resulting in a significant peak of visitors to the ATMOSYS website.

Stijn Janssen worked on the ATMOSYS project and he highlights that, “the high resolution air quality map produced during the project gives an unprecedented view of the air pollution problem in Belgium. It clearly shows where the hotspots are located at a high spatial resolution, which is recognisable for citizens. It contributed to the general understanding and awareness of air pollution phenomena in Belgium and triggered a lot of interest amongst citizens and the national and regional press.”

Transferable tools

ATMOSYS provides valuable scope for replication and will be of interest for air quality organisations working with EU emission inventories, data assimilation techniques, high resolution and micro-scale air quality modelling, INSPIRE compatibility and city and highway measurement campaigns, amongst others. These topics formed the scientific backbone for development of the ATMOSYS system.

Project partners from the Flemish research and technology organisation collaborated closely with key end-user stakeholders, the Belgian interregional environment agency and the Flemish environment agency. Together they developed

the ATMOSYS tool as a system that can be customised when deployed in other regions, for example, by changing the air quality models used or the associated web-based services.

For instance, the ATMOSYS Model Evaluation Service has recently been upgraded with financial support from France’s central laboratory for air quality monitoring. It will be used in national air quality monitoring systems to homogenise all French air quality model evaluations.

Did you know?

Despite considerable improvements in past decades, air pollution is still responsible for more than 400 000 premature deaths in Europe each year.”

European Environment Agency 2015

Project number: LIFE09 ENV/BE/000409

Title: ATMOSYS - Policy support system for atmospheric pollution hot spots

Beneficiary: Vlaamse Instelling voor Technologisch Onderzoek NV

Contact: Lisa Blyth

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Website: www.atmosys.eu

Period: 01-Jan-2010 to 31-Dec-2013

Total budget: €2 354 000

LIFE contribution: €1 087 000



Spain: Applying laser technology for greener ceramics

The **LASERFIRING** project tested a low-emission prototype for developing a new line of ceramic products for the building industry. The prototype reduces CO₂ emissions by up to 40%.



Photo: NEMO EEG/Dimas Ramis

The prototype demonstrated energy and natural resource savings as well as a substantial reduction in greenhouse gas emissions

The manufacture of ceramics for the construction industry (i.e. brick masonry, stoneware, roof tiles and so on) consumes large amounts of energy, resulting in the emission of large amounts of greenhouse gases (GHG). This is because high-temperature firing (up to 1 300 °C) is generally necessary to achieve the required aesthetic finish, even though the desired structural properties can be acquired at lower temperatures.

Whilst laser technology has been used in the ceramics industry (mainly for decoration), it has never been used in structural ceramics. Applying it would enable firing at lower temperatures and thus greatly reduce energy demand and GHG emissions. The research institute, Instituto de Ciencia de Materiales de Aragón, which already had some experi-

ence of this technology, set up the LASERFIRING project (**LIFE09 ENV/ES/000435**) to demonstrate the viability of such an application.

The most difficult challenge that the project faced was finding a way to laser treat all four sides of a brick inside a furnace. To this end, the project team designed a continuous 'roller-furnace' system that integrates two lasers, one on top and one on the bottom of the furnace. In this way, the project was able to achieve excellent finished surfaces for several types of bricks by either changing the composition of clay or by controlling the laser emission parameters. Moreover, the team demonstrated that commercial bricks meeting standard construction requirements could be obtained with temperatures that were 200-300 °C lower than the conventional norm.

LASERFIRING emissions savings

The project's results indicate that the following energy savings and CO₂ emissions reductions can be achieved:

- White firing clay – 28-34%;
- Red fired clays – 10-14%;
- Black bricks – about 35%;
- Gressified clay – 20-30%.

Emissions reductions and energy savings achieved by applying the LASERFIRING process depend on the mineral composition of the clay (see box).

Certain types of brick, however, are not suited to the new process. In these cases, there was poor resistance to frosting and the temperatures required to achieve suitable characteristics were shown to be more or less the same as those used in the standard process.

Nevertheless, the LASERFIRING process was demonstrated to be a feasible way of manufacturing bricks for a range of commercially desirable colours without the use of additives. Moreover, it can achieve aesthetic effects that cannot be obtained by the standard process.

The LASERFIRING project achieved an excellent surface finish for several types of brick



Photo: NEBMO EEIG/Dimas Ramos

Application of the technology is also aided by its significant cost advantages. The installation cost of a LASERFIRING facility is around 10% cheaper than conventional facilities.

“Our prototype demonstrated energy and natural resource savings as well as a substantial reduction of greenhouse gas emissions resulting from the whole industrial process. I hope the project will contribute to the implementation of the patented method in the brick and roof tile industry,” says project manager Germán de la Fuente.

Ceramic revolution

Professor de la Fuente believes that it is feasible to install 10 medium-sized LASERFIRING furnaces (i.e. producing 300 tonnes/day) over the next 10 years. If achieved, this would entail a total production of 1 100 000 tonnes/yr, leading to a reduction in CO₂ emissions of 90 000-to-150 000 tonnes/yr, depending on the reduction in treatment temperature. Prof. de la Fuente also hopes that the technology will, “open the way to new developments in the industry which will enable ‘green’ fabrication of high value-added sub-products within the tile and brick sectors in Europe.”

The beneficiary communicated the advantages of its process at conferences, trade fairs and through organised visits to the pilot plant. The project also organised technical training for brick and tile manufacturers.

The next step is to apply the LASERFIRING technology on an industrial scale. This will require an increase in the power of the laser to ensure uniform treatment of all sides of the brick. Additional funding is being sought to achieve this goal.

The knowhow gained by the project is also being built upon in a follow-up LIFE project, CERAMGLASS (**LIFE11 ENV/ES/000560**), which plans to construct a laser furnace for the treatment of ceramic and glass tiles.

Project number: LIFE09 ENV/ES/000435

Title: LASERFIRING - Climate Change Adaptation of the Structural Ceramics Industry by Decreasing the Firing Temperature Using Laser Technology

Beneficiary: Instituto de Ciencia de Materiales de Aragón, (CSIC-Universidad de Zaragoza)

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Period: 01-Sept-2010 to 31-Aug-2013

Total budget: €2 468 000

LIFE contribution: €1 232 000



Spain: Greening the publishing process

This LIFE project developed an innovative online tool and guidelines to improve the environmental footprint of books and magazines. It allows users to 'green' their publications without specialist knowledge of eco-publishing and eco-design.

Books and magazines have an environmental impact throughout their life cycle. For example, fresh water, energy and forest fibres are consumed to make pulp and paper, which generates waste products as well as air and water pollution. Printing and packaging inks and sealing and reinforcing components can also have an adverse environmental effect.

There have been many initiatives to reduce the impact of the pulp, paper, printing and publishing sectors individually, but these have rarely considered the book and magazine production process as a whole. With this in mind, the GREENING BOOKS project (LIFE09 ENV/ES/000457) in Catalonia was conceived to improve the overall environmental footprint of the publishing sector and help move it towards a more sustainable approach.

Specific goals included: developing a user-friendly software tool, called bookDAPer, to easily allow users to calculate the environmental impact of a book or magazine; developing an eco-label, bDAP, to communicate information on a

publication's environmental impact and good practices to consumers; and establishing guidelines on best practices for eco-publishing and eco-design.

The project was coordinated by LEITAT Technological Center, an expert in life cycle analysis; the other beneficiaries comprised the publishing and communication firm El Tinter Arts Gráficas Edicions i Produccions and the eco-innovation consultancy Simpple.

New eco-publishing tool

An innovative software tool was developed - for designers, publishers, editors and other professionals in the sector - which calculates the potential environmental impact of a publication. The online tool, bookDAPer, available in English, Spanish and Catalan, allows users to identify and quantify the environmental impacts of the different stages of the publishing process for books and magazines. Improvement efforts can then be targeted at key points in the product's life cycle.

The consumption of paper and inks represent almost half the total environmental impact of publishing





The tool was created following a life cycle assessment (LCA) of a standard book and magazine in Europe to identify the potential environmental impacts at all stages, from the production of paper and inks to the final treatment of the item as waste. The results of the LCA showed that a key stage was the consumption of raw materials (paper and inks), representing 49.4% of the total environmental impact, although the printing plate manufacturing (17.6%), distribution (16.4%) and design (9.6%) stages were also relatively important. Whilst the design stage makes only a minor contribution to the environmental load, this is when important decisions are made, so this is the point at which eco-publishing criteria should be defined.

BookDAPer allows users to generate an eco-label - bDAP - for their publications. The label informs the reader about a particular book or magazine's environmental performance. The eco-label indicates the environmental certifications and good practices of the companies involved in making the product. bDAP integrates all existing European eco-labels for paper and environmental management systems. It also highlights the savings achieved in terms of the publication's carbon footprint, waste production, and consumption of water, energy and raw materials.

In addition, the project beneficiaries drew up guidelines on eco-design and eco-publishing of magazines and books to help publishers, design centres and printing houses improve the environmental profile of their products. The manual, 'Good practices for Ecodesign', contains suggestions on how to minimise the environmental impact at each stage of a publication's life cycle: extracting raw materials, design, printing, finishing, packaging, distribution, use and waste management, and end of life.

Cutting costs and the impact

The effectiveness of the online tool was demonstrated through the publication of four pilot products - one magazine and three books - using the best practices detailed in the abovementioned manual. Both the environmental impact and the cost of the publications were reduced, thus proving that eco-friendly products are not necessarily more expensive to make. (Fewer resources and less waste treatment were needed, cutting the pilots' production costs.)

During the project's lifetime, El Tinter published 127 books and magazines using the online tool. With an average of 3 500 copies per publication, a total of 444 500 items were produced. This yielded the following environmental benefits: total energy and water consumption were reduced by 533 400 MJ and 5 245.1 m³, respectively; the amount of waste generated was cut by 800 kg; around 7 tonnes of raw materials were saved; and the products' carbon footprint was reduced by 15.73 tonnes of CO₂ equivalent.



The 'Good practices for Ecodesign' guidelines show how to minimise the environmental impact at each stage of the publication life cycle

The beneficiaries have continued to use the tool and eco-label following completion of the project. Simpple maintains the tool itself, whilst LEITAT verifies and certifies the eco-labels generated. El Tinter is producing publications using the tool and the guidelines, both of which are also available to other organisations; companies affiliated to the bookDAP system pay an annual fee to use the tool. The project partners promote the tool and eco-label at meetings and workshops.

"This project means someone does not need detailed professional knowledge to improve the environmental performance of their publication," says LEITAT's international projects manager, Emilie Mespoulhes. "Currently, 17 organisations are registered to use the tool and 219 eco-labels have been generated with it."

Project number: LIFE09 ENV/ES/000457

Title: GREENING BOOKS - Improving the environmental performance of publications from design to lecture!

Beneficiary: LEITAT Technological Center

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Website: <http://greeningbooks.eu/>

Period: 01-Nov-2010 to 31-Oct-2013

Total budget: €724 000

LIFE contribution: €362 000



Finland: Hand-in-hand for healthy lakes and rivers

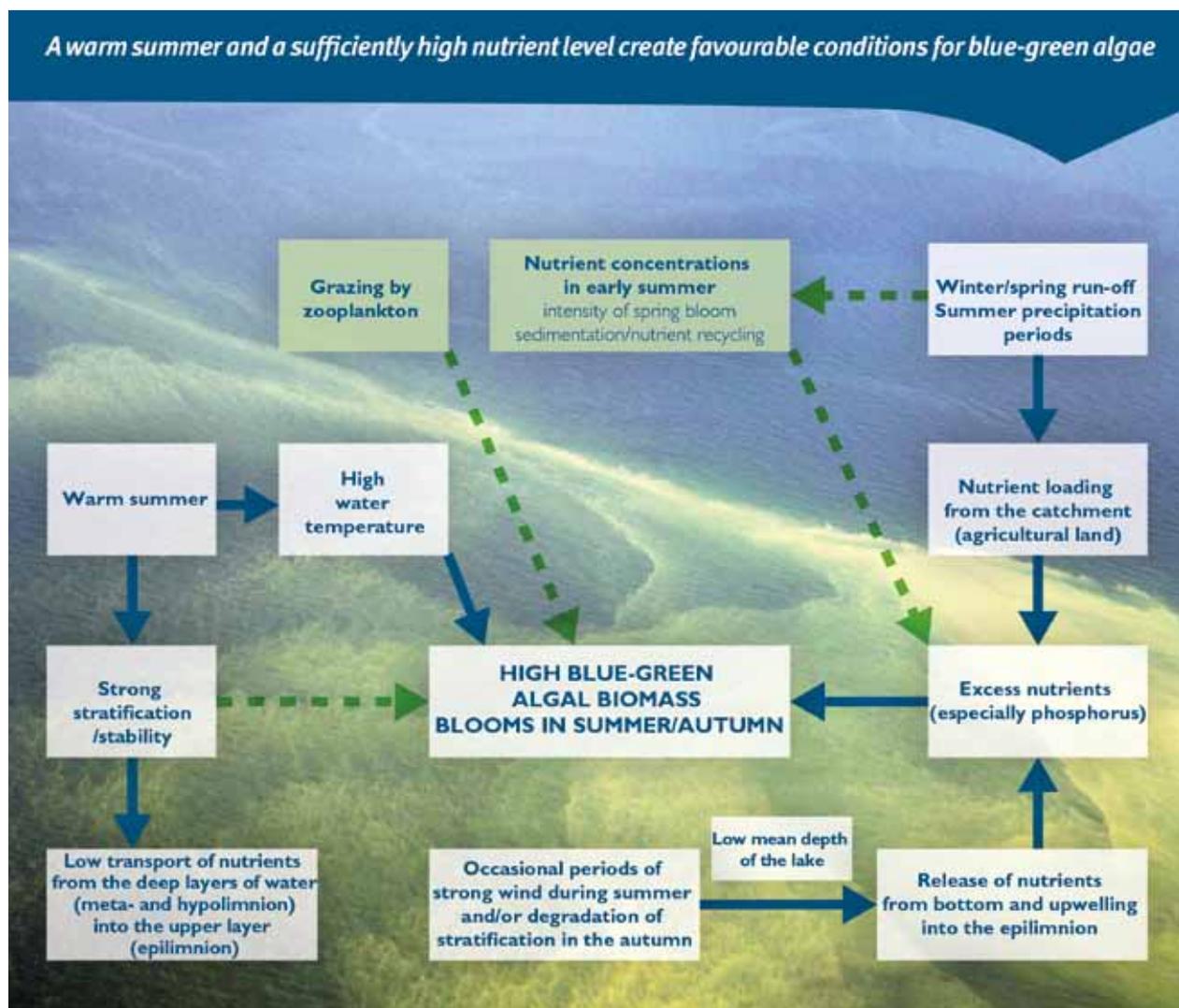
An excess of nutrients in rivers and lakes can lower water quality, leading to eutrophication and potential health problems. The GISBLOOM project involved a full range of stakeholders in taking care of local rivers and lakes.

Nutrients from sewage effluent or agriculture can, in excess, and in combination with high temperatures, induce algal blooms on water bodies. In a process known as eutrophication, the blooms deplete oxygen in the water causing hypoxia, which is fatal to aquatic animals. Climate change is likely to exacerbate the situation by increasing the incidence of extreme hot weather events.

Finland, the “land of the thousand lakes”, is particularly affected by the problem of eutrophication. The solution involves cost-effective monitoring and coherent implementation of river basin management plans. With this aim in mind, the

GISBLOOM project (**LIFE09 ENV/FI/000569**), led by the Finnish environment institute (Suomen ympäristökeskus – SYKE), set out to improve understanding of algal blooms and eutrophication and responses to management measures and to climate change in lakes and coastal areas.

On the basis of nationwide data gathered as part of GISBLOOM and models on climate, hydrology, hydrobiology, land-use, management measures, nutrient loads, and water quality responses, the project team developed and tested a number of tools to enhance monitoring and modelling efforts all over the country.



Everybody can contribute

The LIFE project set up a web-based map service and interactive portal, Järvi-Meriwiki (Lake and Sea wiki), to allow all stakeholder groups and individual citizens to take part in participatory river basin management. Built and maintained in collaboration with Finnish authorities and citizens, users of the wiki can enter information about their local lakes into the system, contribute observations on water temperature, clarity and so on, and add photos or videos. Järviwiki is a platform to discuss the state of and management measures for specific lakes. The project also put the information gathered to use in selecting cost-efficient measures for management plans in 11 pilot areas.

Measures included the introduction of buffer zones, construction of artificial wetlands, fish stock management, clearing of water plants and nutrient and fertiliser management. However, specific local features of the catchment area will largely determine the efficiency of the chosen measures. For instance, buffer zones and a wintertime vegetation cover can be highly cost-efficient in reducing nutrient pollution in areas characterised by sloping fields. In flatter areas, nutrient and fertiliser management as well as agricultural wetlands may be a better choice.

A second online portal, Vesinetti (Waternet), provides access to monitoring and modelling results, mainly targeting a more expert audience. Vesinetti enables the interactive use and exchange of data and models. It comprises a geographic information system (GIS) database and includes basic information about water bodies, to which files and comments can be added by users. Both portals are publicly accessible and have helped to disseminate information about the dangers of eutrophication and increased the public's ability to contribute to the planning and implementation of measures to control algal blooms.

Tools for the big picture

GISBLOOM tested a range of tools for estimating nutrient loads that are available through the Vesinetti portal. These tools give an indication of the amount and type of nutrients the water

body may receive in a specific catchment area, depending on land use and other activities in the entire catchment.

The open-access Lake Load Response (LLR) system is a tool to monitor ecological status. It helps predict the concentration of phosphorus and nitrogen as well as of a specific kind of chlorophyll in a given lake.

Based on information extrapolated from satellite images, the project drew up water quality maps. In addition, automatic measuring stations were established at four of the pilot sites to keep an eye on a number of variables that can play a role in algal blooms, such as nitrate concentration, oxygen, water temperature and salinity.

Finally, two socioeconomic decision-making tools were used to compare the cost-effectiveness of a variety of individual mitigation measures and their combinations at catchment area scale as well as the recreational value of water bodies when considering improved water quality.

The great success of GISBLOOM's tools and its operational model is proven by the countrywide take-up of its approach in Finland. SYKE established a consultancy service shortly after the completion of the project, which continues to provide support to the Finnish ministry of the environment and other authorities and stakeholders. The available data and models are integrated into river basin management plans and thus contribute to the environmental objectives of the EU Water Framework Directive (2000/60/EC), the Marine Strategy Framework Directive (2008/56/EC) and the Nitrates Directive (91/676/EEC).

"The collaboration was very fruitful," says project coordinator Olli Malve of SYKE. He was one of 70 researchers and experts from SYKE and numerous other partner organisations participating in GISBLOOM. "During the project, the tools we developed were tested in real-life pilot areas across Finland. It was a good opportunity to demonstrate our methods and to get feedback on them. This kind of project is really difficult to fund. Therefore, I think it would have been impossible without LIFE."

Run-off of phosphorous from clay soils in the River Fields Vantaanjoki catchment area



Photo: Liisa Hämäläinen/SYKE

Project number: LIFE09 ENV/FI/000569

Title: GISBLOOM - Participatory monitoring, forecasting, control and socio-economic impacts of eutrophication and algal blooms in river basins districts

Beneficiary: Finnish Environment Institute – Suomen ympäristökeskus

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Period: 01-Oct-2010 to 30-Sep-2013

Total budget: €3 061 000

LIFE contribution: €1 504 000



Greece: Reducing greenhouse gas emissions from waste

Products can emit greenhouse gases (GHGs) throughout their life cycle, meaning that appropriate waste treatment can have a considerable impact on emissions. The WASTE-C-CONTROL project created a tool to help waste managers reduce their GHG footprint.



The expansion of the recycling system in the region of Western Macedonia increased recovery of recyclables by 25%

According to the European Commission about one-third of man-made emissions of methane (CH_4) in the EU can be attributed to solid waste management. This GHG is mostly released when biodegradable wastes decompose in landfills. In Greece, approximately 80% of waste goes to landfill, so methane emissions management is of great concern. Practical and cost-effective measures such as waste prevention, recovery, reuse and recycling, biological treatment, and engineered landfilling can make a difference.

The LIFE project WASTE-C-CONTROL (**LIFE09 ENV/GR/000294**) tackled the emissions issue by developing a software tool to optimise waste management processes. The tool helps local and regional authorities assess, monitor, control and report emissions from solid waste management activities, so that they can make informed decisions.

The project was coordinated by Environmental Planning, Engineering and Management (EPEM) and waste management authorities from Eastern Macedonia and Thrace, Western Macedonia and Chania (Crete).

“The general idea was that the tool would provide a simulation environment, where an existing or desired regional or local waste management system could be designed by the user,” says EPEM’s project manager Nikos Gargoulas. Once the relevant data have been imported into the system, it calculates the optimal values for a variety of options and decision variables. It guides the user towards cost-effective solutions for reducing GHG emissions and ones that are tailored to specific situations. Such options include cutting energy consumption, installing other waste management technologies, updating the collection vehicle fleet, better controlling biogas emissions from landfills, recycling, and others.

“This is a decision-making tool which incorporates both the best environmental solution and the cost aspect,” adds Mr Gargoulas. “The software contains an extensive library with economic data (capex, opex) and environmental data (emissions, fuel consumption etc.), for each waste management technology type. This information has been derived from literature and from questionnaires distributed to operating plants throughout Europe.”

Great results for partner regions

For the three participating regions, the project team conducted pilot studies and developed Local Action Plans (LAPs) on the basis of the results obtained thanks to the tool, which already began producing great results during the runtime of WASTE-C-CONTROL. The LAPs encompass specific quantitative goals for GHG emission reductions, specifying the means to attain them as well as the investments required and their timing.

Through the implementation of the LAP over a 20-year period, it is estimated that GHG emissions would be reduced by 1.6 million tonnes CO₂e in Eastern Macedonia and Thrace, 192 000 tonnes CO₂e in Western Macedonia, and 75 000 tonnes CO₂e in Chania region (Crete).

Initial short-term measures, carried out until the end of 2013, though, have already been successful. For the region of East Macedonia and Thrace, for instance, where these measures achieved GHG savings of 5 270 tonnes carbon dioxide equivalent (tCO₂e), the project produced practical guidelines for waste-transfer stations, improved the management of landfill gas, conducted an information and awareness-raising campaign, and supplied recycling equipment (4 000 blue bins, 35 refuse collection vehicles and four bag openers).

With assistance from a local ecology group, municipal solid waste streams were monitored and weighed at household level for eight households over five months in Rhodope. These efforts showed that 67% of this household waste could be recycled or composted, achieving an estimated emissions reduction of 1.53 tonnes CO₂e.

On the basis of the results, Western Macedonia region added 4 900 new bins to increase recovery of recyclables by 25%, and bought 14 waste collection vehicles. At the Kozani transfer station, the improvement of the press system led to an estimated emissions reduction of 3.31 tonnes CO₂e, whilst the 10 biofilters purchased and installed as part of the project reduced CH₄ and CO₂ emissions by 76% and 78.5%, respectively, in 2013.

Chania region on Crete focused some of its efforts on biogas control and monitoring. In addition, the project helped install new sorting technology and constructed transfer stations, to reduce vehicle journeys. The team also promoted organic waste collection, working with large scale units in hotels or military facilities, for instance, where organic waste is now collected in separate containers. This diverted large amounts of biodegradable waste from landfills, whilst enhancing the production of compost material. All in all, Chania reduced its GHG emissions by 1 269 tonnes CO₂e during the project.



The 10 biofilters reduced CH₄ and CO₂ emissions by 76% and 78.5%, respectively, in 2013

Emissions reduction opportunity

Through capacity building, the project also achieved another important goal: passing on information about opportunities to reduce GHG emissions, not only to the general public, but to collaborating authorities. Whilst their everyday waste management priorities tend to lie elsewhere, they soon realised the benefits of GHG emissions reduction. Hence, the LAPs were officially approved by the relevant boards of directors, becoming part of their proposed future actions.

Whilst specific management plan priorities vary, the great benefit of the WASTE-C-CONTROL tool is its transferability. For example, EPEM has successfully tested the tool in the framework of a project in Kosovo, funded by the EU's Instrument for Pre-Accession Assistance (IPA), where it is helping to plan for new waste management infrastructure facilities.

Project number: LIFE09 ENV/GR/000294

Title: WASTE-C-CONTROL - Waste management options for greenhouse gases emissions control

Beneficiary: EPEM – Environmental Planning, Engineering and Management S.A.

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Period: 01-Oct-2010 to 30-Sept-2013

Total budget: €2 363 000

LIFE contribution: €1 004 000



Italy: Sustainable solutions for stranded seagrass

P.R.I.M.E partners developed an integrated management system that uses innovative tools to collect and reuse large deposits of seagrass that wash up on beaches in Apulia in a more sustainable way.

Neptune grass (*Posidonia oceanica*) is listed as a priority habitat in the EU's Habitats Directive. It can be found in large but rare underwater meadows in the Mediterranean Sea and is important for a healthy marine and coastal ecosystem. The meadows shelter marine animals from predators; help protect the coast from erosion; and produce large amounts of oxygen and biomass. Trawling, boat anchors, coastal overdevelopment and water pollution threaten this species in some parts of the Mediterranean.

In the autumn, parts of the plant come loose and wash up onto nearby beaches forming large mounds (banquettes) which then begin to decompose. These banquettes slow down coastal erosion and help maintain dunes but they are often also considered unpleasant by beach users. Thousands of tonnes of residues are therefore collected by municipalities each year and disposed of in landfill sites. Current guidelines on the management of its removal are however generic and ineffective and existing practices are wasteful and negatively impact the fragile coastal ecosystem.

An integrated management system

P.R.I.M.E. (**LIFE09 ENV/IT/000061**) identified criteria for the sustainable management of these seagrass residues and used scientific research to find ways to re-use them. The project was led by the town of Mola di Bari in partnership with the Italian National Research Council - Institute of Sciences of Food Production (CNR – ISPA), ECO-Logica Ltd, Aseco Inc and Tecoma Drying Technology Ltd. The goal was to build on CNR-ISPA's years of expertise in Neptune grass management whilst testing possible use of this biomass in agriculture, safeguarding Neptune grass meadows and raising public awareness about the issue.

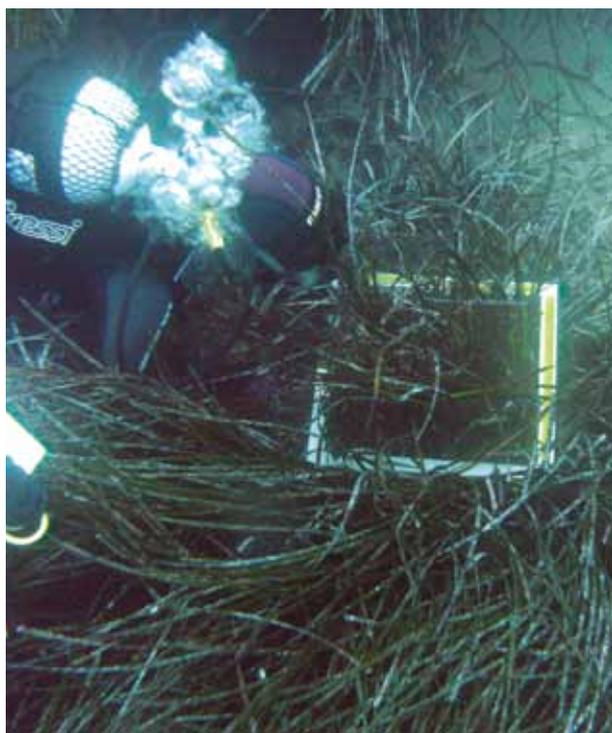
The project team started by drawing up an integrated management plan concerning residue processing, which specifically looked at ways to reduce the environmental impact of harvesting the seagrass. Recommendations included: maintaining and leaving banquettes onsite where possible; specific removal procedures to preserve the coastal environment if



Neptune grass (Posidonia oceanica) is often washed ashore during autumn

removal is necessary; and the best ways to re-use the material as compost.

Partners also examined the regulations and technical aspects necessary for the implementation of Neptune grass based compost production in a commercial composting factory "As far as we are aware, this was the first experience of this kind on an industrial level," says project manager Antonella Lomoro from ECO-Logica Ltd. This part of the project also included the design and implementation of a new machine: a rotary sieve, which uses seawater to separate the sand from the plant, combined with a shredder, which reduces the size of the material allowing for easier transport. Both make the composting process easier and reduce environmental costs.



The project team investigated ways to re-use Neptune grass

According to Ms Lomoro, the most rewarding part of the project was, “being able to demonstrate that Posidonia residues could be turned into high-quality compost.” P.R.I.M.E. successfully tested the compost as an alternative to peat for growing seedlings, vegetables and ornamental plants in greenhouses. It was also used to improve the quality of soil as an organic fertiliser.

Another important part of the project was the comprehensive communications campaign carried out by the team. “The communications work on beaches was particularly crucial,” believes Ms Lomoro. Beach users were approached and informed about the important role of Neptune grass on the coast. The aim was to raise awareness and increase the degree of acceptance regarding the presence of the deposits and their natural role on the beaches. “It was exciting dealing personally with people who were directly affected by the issue,” says Ms Lomoro.

Threats and opportunities

“Unfortunately, despite our communications activities we repeatedly witnessed deposits being collected with heavy vehicles and taken to landfill sites,” recalls the project manager. “Trying to get people to understand and implement a better way to collect *Posidonia* was extremely frustrating at times.”

In spite of this, there has been an increase in municipal awareness about good practices in Neptune grass management as a result of the project. “Now the intensive dissemi-

nation of the project results is vital to ensure that awareness continues to be raised,” Ms Lomoro. To this end, the project team has applied to the Ministry of the Environment for the formal adoption of the project’s *Guidelines on the sustainable management and recovery of beached Posidonia*. “We would like to see the sustainable techniques and methods implemented during the project become a standard reference for the collection of seagrass,” says Ms Lomoro.

Some municipalities that adopted the project’s recommendations whilst it was taking place reverted to old habits after it had finished. At national level P.R.I.M.E. was mentioned in legislation as being an “innovative solution for the use of seagrass in composting” but this reference was later removed. “We are also still awaiting the formal adoption by the Environment Ministry of our *Guidelines on the sustainable management and recovery of beached Posidonia*,” Ms Lomoro points out.

At least three of the five composting factories in Apulia have initiated composting of waste Neptune grass as a result of the project and other initiatives arising from it. In addition, a number of municipalities and entrepreneurs have shown an interest in applying the strategies developed by P.R.I.M.E. and project partners are continuing to research the alternative use of stranded Neptune grass.

A circular beach economy

From a socio-economic point of view, the project has contributed to a greater awareness of local communities about the ecological importance of Neptune grass residues and the economic opportunities linked to reuse. This is certainly the message that project partners want to convey to potential users of its outcomes. “We hope that the techniques and methods of sustainable collection implemented in coastal communities during the project become a standard reference,” says Ms Lomoro. “P.R.I.M.E. was a beautiful adventure shared by all partners. There may have been many difficulties but there were also many rewards,” she concludes.

Project number: LIFE09 ENV/IT/000061

Title: P.R.I.M.E. - Posidonia Residues Integrated Management for Eco-sustainability

Beneficiary: Municipality of Mola di Bari

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Period: 01-Sept-2010 to 31-Dec-2013

Total budget: €1 153 000

LIFE contribution: €568 000



Italy: Preventing waste production in Chianti

This LIFE project developed a pilot strategy for the prevention and sustainable management of waste in Chianti, in line with Italian national and EU policy. Its approach serves as a model for waste prevention on a local level.

The EU's Waste Framework Directive of 2008 emphasised prevention above recycling and reuse. By 2006, the amount of waste produced in the EU had risen to around 1.3 billion tonnes/yr and environmentalists were aware of the great need to demonstrate how EU policy could be implemented.

The WASTE-LESS IN CHIANTI project (**LIFE09 ENV/IT/000068**) was launched in response, with the aim of showing how the Province of Florence, and in particular the Chianti region, could produce less waste. The province was aptly chosen, as it had one of the highest per capita waste production rates in Europe – a total of 669 kg per year in 2007 (The EU-27 national average was 546 kg per year).

The main objective of the LIFE project was to implement a pilot strategy for waste prevention and sustainable waste management in this local community ('The Chianti plan', approved by the provincial council of Florence in December 2007). Reflecting the waste management hierarchy established by the

Waste Framework Directive (2008/98/EC), the Chianti plan encourages waste prevention through the introduction of collection schemes, accounting systems, collection fees and regulatory frameworks. It also promotes the use and marketing of recycled materials.

The project had to overcome certain challenges to achieve its goals. Involving local stakeholders and citizens in the implementation of the project actions was resource intensive and time consuming, and required a strong commitment from the local authorities. As a consequence, the project focused much effort on the training of staff members and decision-makers at the participating towns in the pilot area. It also carried out an intensive campaign to raise local awareness.

These actions paid off. The LIFE project made a measurable difference to waste management in Chianti. There was a 9% reduction in total waste generated in the region between 2010 and 2012. The amount of unsorted waste sent to final disposal fell by 28% over the same period, nearly double the

The WASTE-LESS IN CHIANTI project created a reuse centre



15% reduction targeted. The collection of separate waste was also improved.

Further improvements in the performance of the waste management system were observed in 2014, according to Orsola Bolognani, the director of Ambiente Italia, one of the project partners. "The results achieved by the project demonstrate that the project approach effectively implements the European waste management hierarchy and fully achieves, or even surpasses, the related targets," she says.

Replicating results

One of the most important outcomes of the project is its high replicability in other territories. In fact, the project approach has already been adopted in some Italian municipalities under the MED Zero Waste Pro project, which is supported by the European Regional Development Fund. "The project strategy is easy to implement and doesn't require intensive investments by local communities," explains Ms Bolognani. "The project approach also provides some relevant economic and social benefits at the local level in the pilot area. These are related in particular to the positive 'territorial marketing' effects of the economic activities (tourism facilities, cafés and restaurants, shops etc.)...linked to the implementation and promotion of the 'waste-less' label."

Other economic benefits relate to the cost savings for the local authorities thanks to the reduction of the amount of waste sent to final disposal and to the door-to-door collection of recyclable materials. Households also benefit financially from lower waste collection fees, owing to the introduction of a pay-as-you-throw (PAYT) system made possible by individual accounting of waste.

The project gave citizens reusable receptacles for sorting waste



The project successfully implemented a pay-as-you-throw system

Further cost savings derive from the efficiency of the applied e-gate technology for measuring the amount of undifferentiated waste individually produced by users that is run alongside the door-to-door collection of the recyclable materials. Such a set up also offers more flexibility to households.

The key element, however, of the project's strategy is that it integrates these separate schemes into a single approach. Moreover, existing schemes often operated on a national and regional level, but the project brought waste management to the stakeholder and end user level. "The project demonstrated the effectiveness of combining many different good practices in a comprehensive approach, characterised by the implementation of many concrete waste prevention actions through the active involvement of many different local stakeholders, accompanied by the revision of waste collection schemes and the related regulatory/charging framework in a 'waste prevention' perspective, and by extensive local communication campaigns," sums up Ms Bolognani.

Project number: LIFE09 ENV/IT/000068

Title: WASTE-LESS in CHIANTI - Waste Prevention and Reduction in the Chianti Territory

Beneficiary: Provincia di Firenze

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Period: 01-Dec-2010 to 31-Dec-2013

Total budget: €1 088 000

LIFE contribution: €505 000



Italy: Developing practical tools to cut air pollution

The goal of the OPERA project was to develop a methodology that supports local and regional authority actions to improve air quality. This was implemented using an innovative software tool called RIAT+ (Regional Integrated Assessment Tool).

EU policy highlights the importance of air quality¹. “Despite the legislation, some regions in Europe produce or maintain pollutant levels that threaten human health and ecosystems,” says Eriberto De Munari from the Agenzia Prevenzione Ambiente (ARPA) in Emilia-Romagna. Mr De Munari coordinated the LIFE project OPERA (LIFE09 ENV/IT/000092) which set out to give authorities across Europe a practical tool to address air quality problems at local and regional levels.

“The main goal of the OPERA project was to develop a methodology for assessing the efficiency of measures being planned for tackling such air quality issues,” explains Mr De Munari. The project also “sought to devise methods that allow local authorities to identify and apply the most effective, and economically viable, abatement measures (in line with the national and international frameworks). These

would also take into account possible synergies with greenhouse gas emissions reduction measures.”

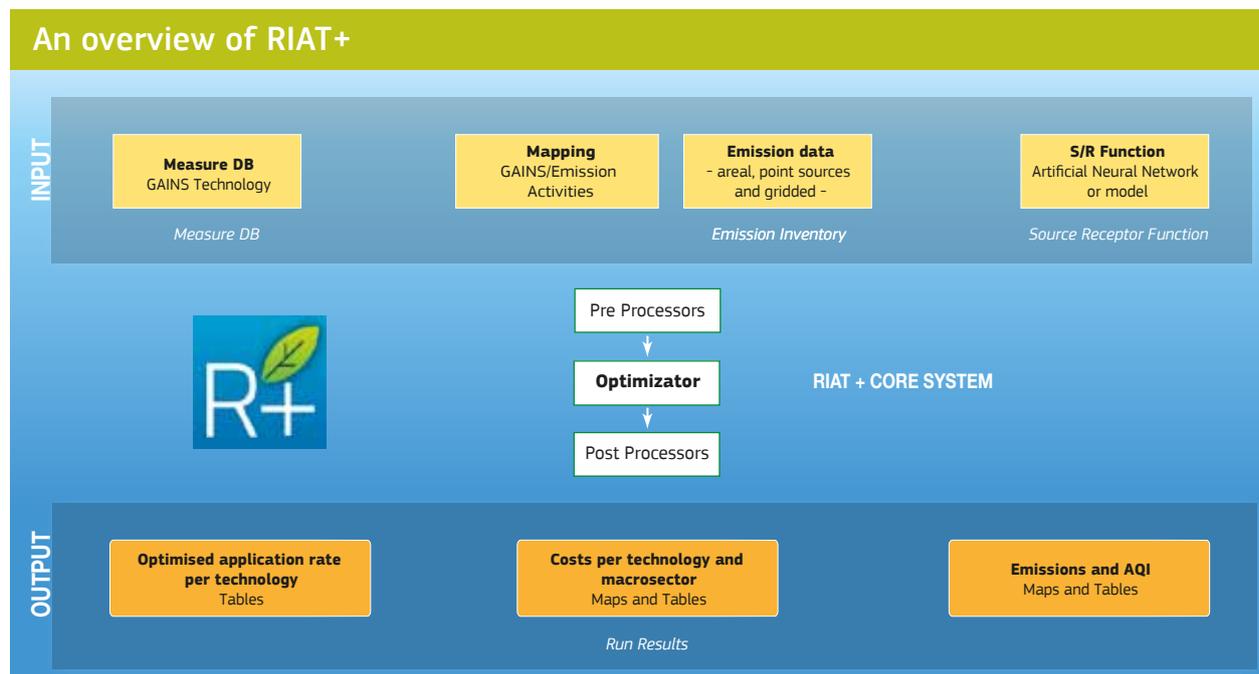
Cost-conscious emissions reduction

To achieve its aims, the project developed RIAT+, a software tool designed for regional authorities with limited budgets to reduce population exposure to air pollutants and to meet air quality standards, especially for fine particulate matter (PM₁₀, PM_{2.5}), nitrogen dioxide (NO₂) and ozone (O₃).

The RIAT+ system acts both as regional assessment software and as an integrated modelling environment through which air quality simulations on a regional scale can be produced. As a modelling system, RIAT+ uses air quality indicators to assess potential pollution abatement measures in light of EU limits and future concentration reduction deadlines. It incorporates Artificial Neural Networks (ANNs), to capture non-linear relationships between pollutant emissions and concentrations.

¹ E.g. The EU's Thematic Strategy for air quality [COM 2005 446] and Directive 2008/50/EC on ambient air quality and cleaner air for Europe

An overview of RIAT+



“RIAT+ supports decision-makers in defining air quality plans by suggesting optimal emissions reduction measures to improve air quality, given a pre-defined budget,” explains Mr De Munari. Each action within an air quality plan is evaluated in terms of the change in air quality and the cost, thereby enabling users to select cost-effective emissions-reduction measures.

The tool developed by the OPERA team differs from typical decision-support systems in that it uses a closed loop (optimisation) rather than an open loop (scenario) analysis. It can be set either to maximise environmental benefits at fixed cost or to minimise costs for a fixed environmental benefit. In addition, “users may introduce their own source of information or data (e.g. emissions inventories, air quality models, abatement technologies) on top of default assigned values,” says Mr De Munari.

Between 2010 and 2013, the OPERA project tested RIAT+'s methodology and software in two regions: Alsace (France) and Emilia-Romagna (Italy). In both regions, it highlighted effective measures to reduce air pollution.

In Emilia-Romagna the application of the RIAT+ tool led to the setting of emissions reduction targets in the air quality plan (AQP): PAIR 2020. In 2014, the regional government adopted the plan, which defines the emissions reduction targets at regional level for NO_x, PM₁₀, VOCs, NH₃ and SO_x and the main sectors where intervention is needed (primarily transport, energy, agriculture and industry). “Special attention will be paid to the sustainable management of urban areas, reducing GHG emissions and improving air quality,” says Mr De Munari.

“The use of the RIAT+ tool has not only allowed us to adopt a first air quality plan, but it has allowed us to adopt meas-

ures that are based on scientific and technical data and for which we know the cost,” says Katia Raffaelli, who is responsible for Emilia - Romagna's AQP. This increases the credibility of the regional authority's decisions, which in turn, “will translate into a stronger policy that can be enforced on the territory. It has also enabled us to give a technical and scientific response to all our stakeholders (citizens, local authorities, agricultural sector, and industries) on the issue of air quality management which has a greater impact on changing their behaviour,” she adds.

In Alsace, the authorities have used RIAT+ to define a list of potential measures for inclusion in the next revision of the Regional Scheme on Air, Energy and Climate Alsace (SRCAE). “It is also enabling policymakers to highlight potential new actions,” adds Mr De Munari.

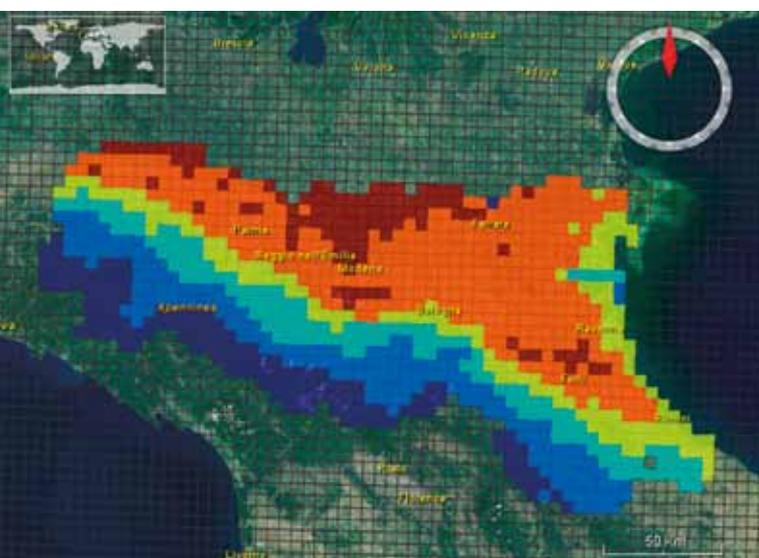
European potential

The fact that RIAT+ can be used to determine the cost of measures in advance, particularly structural measures, makes it especially useful to public administrations at national, regional and local levels throughout the EU. “It can fit with existing systems that already work at the country and continental scale, so we think OPERA's approach provides potential for other countries and regions to resolve their air quality problems,” says Mr De Munari.

Philippe Thunis from the Air and Climate Unit in the European Commission's Joint Research Centre – JRC – says that RIAT+ is unique in its ability to work at the regional scale in both “what-if” analysis and “optimisation” modes. “Other approaches either solve the problem through optimisation but at larger scale (European scale) or work at regional scale but only in “what-if” analysis mode,” he explains.

The JRC is continuing to work with the other project partners to develop the tool so that it can be applied at high spatial resolution across Europe and enable EU-wide impact assessment analysis with a focus on the regional scale.

Average PM10 concentrations



Project number: LIFE09 ENV/IT/000092

Title: OPERA - An integrated assessment methodology to plan local cost-effective air quality policies harmonized with national and European actions

Beneficiary: Agenzia Prevenzione Ambiente Emilia-Romagna

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Website: www.operatool.eu

Period: 01-Sept- 2010 to 30-Sept-2013

Total budget: €2 301 000

LIFE contribution: €1 090 000



Sweden: Innovative technology for the re-use of waste oil on ships

The Pure Energy Separator project developed a technology and procedures for recovering waste oil on ships. With potential savings on fuel costs and environmental benefits, this could be an important contribution to the green economy.

The global shipping industry consumes around 410 million tonnes of fuel oil every year. Around 0.5% of this is removed with dirt particles and water during the fuel cleaning process. This oil is stored in sludge tanks, and is eventually incinerated at sea or on shore.

With support from LIFE – the Pure Energy Separator project (**LIFE09 ENV/SE/000352**) – enabled beneficiary Alfa Laval Tumba to use innovative centrifugal ejection technology to develop a means of more effectively expelling sludge in the separator. The new method produces a highly concentrated sludge without using any process water (thus also generating less wastewater). More than 90% of the oil in the waste oil is reused, reducing the amount of waste oil that must be incinerated. This is in line with a key objective of the Directive for the Disposal of Waste Oils (75/439/EEC).

How the separator works

In operation, the system continuously separates waste oil into three phases: cleaned oil (with less than 5% water content), water (with less than 1 000 ppm oil), and dry sludge. It comprises a separation module with a control unit, a heating module, a pumping module and a dosing unit. The system can operate at flow rates of up to 500 litres per hour, sufficient for processing the waste oil generated by medium-to-large sized vessels. The separation module has a disc stack that rotates at high speed and forces solids to the periphery, where they are removed using a spiral-shaped device. Meanwhile, an oil paring disc sends oil under pressure into an oil recovery tank and a water paring disc sends water into another tank. The heating module is used to maintain an optimum separation temperature of 95°C.

The compact system was designed to be easily integrated with existing onboard systems typically found on ships. This integration enables further treatment of the wastewater produced by the separator so that it can be safely discharged into the sea. The recovered oil is reused as fuel

and the solids are separated to produce a dried sludge for disposal as dry waste onshore.

The beneficiary constructed four oil separator prototypes during the LIFE project, testing these in its own laboratories and in industry workshops (Scania, Sandvik and Mayfran). Lessons from this research phase could be applied in future developments of separator technology. One particular challenge to overcome was wear-and-tear problems, for example, which required the regular changing of parts that would make the operation uneconomic.

Sea trials

Improved versions of the separators were installed and demonstrated in case studies on two ferries operated by the Tallink & Silja Line between Sweden and Finland. One of the case studies was aboard M/S Silja Symphony, which consumes about 50 tonnes/day of fuel oil and sails one in every two days on average. Waste oil was collected from service tanks,

Oil separator devices were installed and tested on marine vessels



Photo: Niclas Bongren

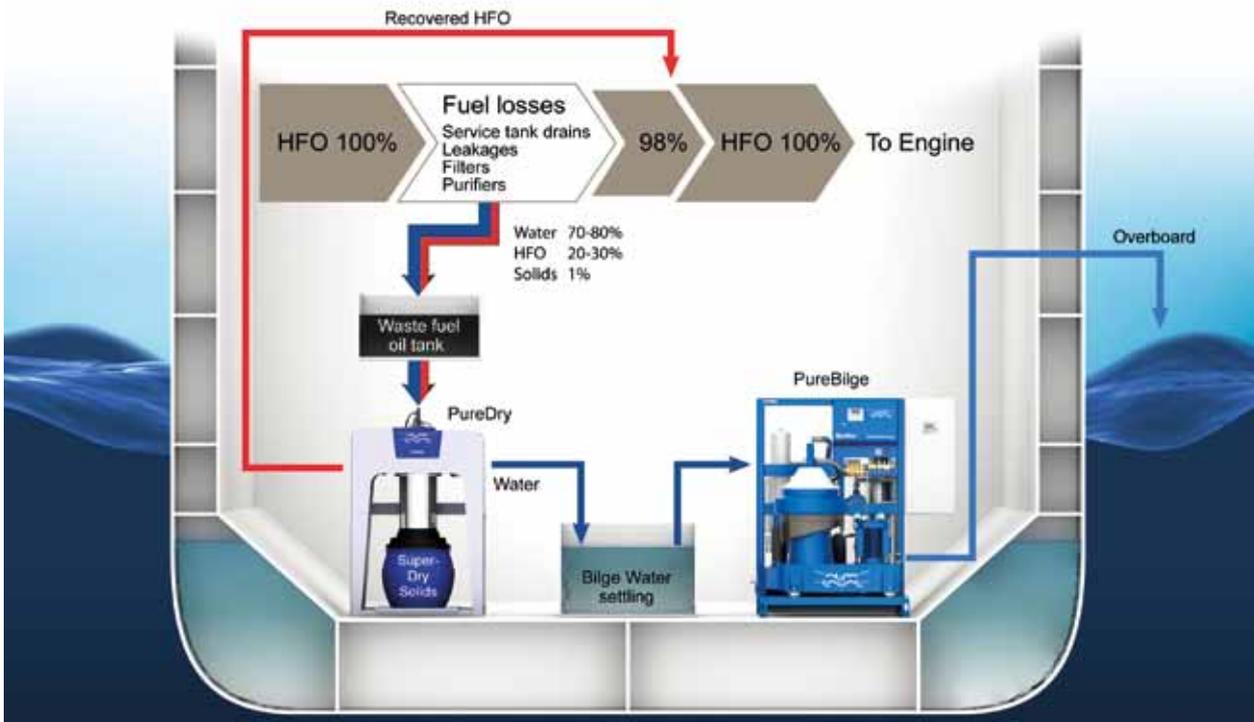


Diagram of how the innovative continuous ejection technology works

automatic filters, fuel separators and other sources, and sent to a dedicated tank for processing by the new technology. The project recovered some 150 m³/yr of waste oil from this ship, sending it to intermediate tanks before it was returned to the boiler room for reuse. Wastewater was sent to a bilge holding tank. The ferry produced some 5–10 kg of solids every day, which was landed along with other dry waste.

The test cases on the ferries demonstrated that fuel bills could be reduced through the recovery of waste oil. The amount saved depends on a number of factors, including the fuel consumption of the engines, the price of fuel, the length of time the vessel is at sea, and the percentage of fuel that can be recovered.

Environmental benefits result from using recycled oil instead of entirely new oil. The separator could reduce annual fuel consumption by up to 2% in larger vessels, which means reductions in the amount of oily waste that requires disposal and in CO₂ emissions. The beneficiary estimates that each installed system could reduce fuel oil consumption by 210 m³/yr on average, corresponding to 630 tonnes of CO₂/yr. This could represent a valuable contribution for shipping companies wishing to reduce greenhouse gas emissions to meet environmental targets.

Heading to market

The project's dissemination activities mainly focused on informing potential customers of the prototype specifications and advantages. Alfa Laval anticipated a high market demand

for this technology, with an assembly line under construction and pre-orders from companies taken by the time the LIFE project had finished.

"Big vessels no longer need to send heavy fuel oil sludge ashore for destruction, and at the same time fuel consumption and CO₂ emissions are reduced," says project manager, Tomas Oldebäck. "The method has been tested in eight vessels, shown to work, and it is now on the market."

Alfa Laval is marketing the separator and a service package to the global shipping industry under the PureDry brand name. The company describes PureDry as "a fully automated, modular system designed to treat waste oils onboard ships and in power plants." It is expected to become a standard feature on large vessels in the near future.

Project number: LIFE09 ENV/SE/00035

Title: Pure Energy Separator – Innovative Centrifugal Separator Technology for Energy Recovery and Oily Waste Volume Reduction

Beneficiary: Alfa Laval Tumba AB

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Website: www.alfalaval.com/products/separation/centrifugal-separators/Separators/PureDry/

Period: 01-Sept-2010 to 30-Jun-2014

Total budget: €3 108 000

LIFE contribution: €1 439 000



Finland: Producing the world's first arsenic/rock aggregate guidelines

Researchers in Finland have investigated and developed risk management tools for arsenic in crushed rock aggregate widely used in construction. A priority is now to disseminate the ASROCKS' guidelines – the first of their type worldwide.

Arsenic occurs naturally in European bedrock and soil. The largest area with higher than average arsenic concentrations in Finland is around the cities of Tampere and Hämeenlinna – the demonstration area of LIFE ASROCKS (LIFE10 ENV/FI/000062) a pioneering project by the Geological Survey of Finland (GTK). Arsenic from soil and rock may locally leach into groundwater. The mean exposure of Finnish inhabitants to naturally occurring arsenic is, however, minute in comparison with many other European countries.

In areas with high arsenic concentrations, human exposure to arsenic can potentially be locally increased by rock aggregate production – one of the most important process industries in the construction sector – as well as by earth moving and excavation activities. Possible routes of exposure include atmospheric dust, exposed earth, and leaching into drinking water. Risk assessment covers all steps of production, also taking into consideration the extent of activity, natural conditions

and local land-use. Adverse effects can be prevented by applying good risk management techniques and best available technology. In addition to human exposure, adverse effects are possible on aquatic organisms if surface waters contain high concentrations of arsenic.

'No clear guidelines'

Prior to LIFE ASROCKS, there were no clear guidelines or instructions on the various problems associated with naturally-occurring arsenic. Extraction and construction works usually require permits or environmental impact assessments. Yet, according to Kirsti Loukola-Ruskeeniemi, the ASROCKS project manager, there was "no consistent approach" applied by the relevant authorities either in Finland, or elsewhere, to the control of such potential contaminants in groundwater. Valid information was also generally lacking about the behaviour of arsenic in soils and bedrock.

Surveys were carried out on bedrock extraction sites that were expected to be sources of arsenic emissions and leaching



Photo: Paavo Härmä

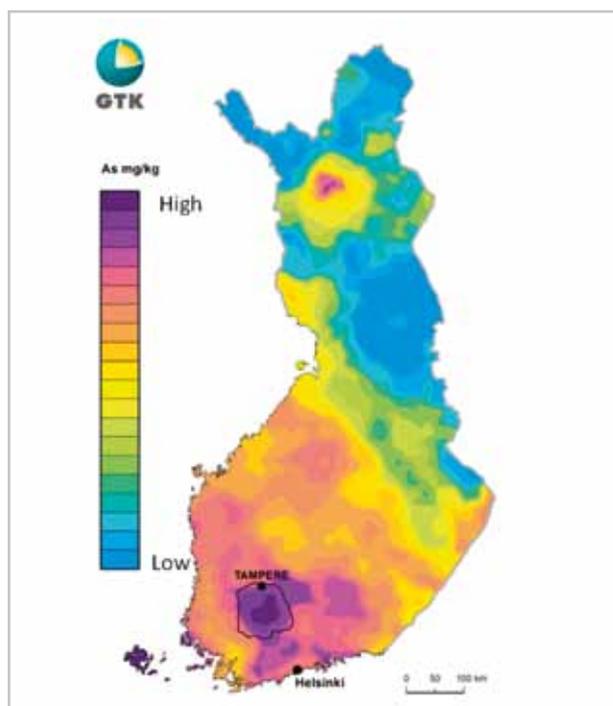
The main objective of this LIFE project was therefore, to provide guidelines for the exploitation of natural aggregate resources (crushed bedrock, sand and gravel) in an area with elevated arsenic concentrations in bedrock and soil. Guidelines would also be developed for the re-use of aggregates in construction sites in areas with a high natural occurrence of arsenic. The demonstration area was the Tampere-Häme region where natural arsenic in bedrock and the soil was known to be problematic.

Specific objectives were threefold: to identify the current aggregate production areas and planned large construction sites with potential for arsenic hazards; to identify the environmental impacts at demonstration sites - potential pathways to surface and groundwater would be investigated in sites that showed elevated concentration of arsenic; and to develop a risk assessment and risk management procedure at the sites in order to produce a decision-support model for the aggregate production and application in construction sites in areas with a high natural occurrence of arsenic.

Survey of 20 sites

As planned, the LIFE ASROCKS team surveyed 20 soil and bedrock extraction sites that were expected to be sources of arsenic emissions and leaching. Of these, four were selected for detailed analyses including leaching tests and emissions as a result of extraction and soil and bedrock processing works. An air quality survey was not included in the original plan, but was deemed to provide added-value to the overall results.

Distribution of arsenic in till in Finland



Source: Geochemical Atlas of Finland, Part 2: Till.

Did you know?

Aggregate production is one of the most important process industries in the construction sector. According to the European Aggregates Association (UEPG), the EU (excluding Croatia) produces some 3 billion tonnes/yr of aggregates.

Source: ASROCKS layman's report

Findings from this important survey work informed the design of the new guidelines for sustainable aggregate production and construction in arsenic-rich areas. These guidelines focus on introducing a consistent method for landowners and authorities regarding sampling the rock and soil. This unified approach extends to advice on handling extraction permits, including the use of obligatory environmental impact assessment procedures for larger extraction proposals.

In Finland and in other Nordic countries, the natural environment contains only small average amounts of arsenic compared to many other regions, such as central and southern Europe. "As far as we know, this was the first research project in the world to study and find out how arsenic is leached and transported from aggregate production and earthmoving and excavation activities," says Ms Loukola-Ruskeeniemi. "The results of ASROCKS, and the guidelines that have been drawn from these results, can be applied in other countries where arsenic risks are more severe."

More generally, the results can be used in the further development of the EU soil thematic strategy and in water management plans (regarding the protection of ground and surface waters) based on the Water Framework Directive.

"Being recognised as a Best LIFE Environment project is extremely gratifying for our research team, which has worked hard to find solutions for a severe environmental problem impacting the industrial activity and people in Europe and elsewhere," says Loukola-Ruskeeniemi. She puts the project's success down to teamwork: "Specialists from different backgrounds and competences worked together seamlessly and with great passion."

Project number: LIFE10 ENV/FI/000062

Title: Guidelines for Sustainable Exploitation of Aggregate Resources in Areas with Elevated Arsenic Concentrations

Beneficiary: The Geological Survey of Finland (GTK)

Contact: Kirsti Loukola-Ruskeeniemi

Email: kirsti.loukola-ruskeeniemi@gtk.fi

Website: <http://projects.gtk.fi/ASROCKS>

Period: 01-Sept-2011 to 31-Aug-2014

Total budget: €1 157 000

LIFE contribution: €579 000



Greece: ArcFUEL maps risks to prevent forest fires

This trans-national project is helping to tackle forest fire threats in Mediterranean countries through high-tech yet low-cost mapping of forest fuel.



A forest fire in Gertosa, Portugal

Fire prevention is one of the main challenges in modern-day forest management. Mitigating fire risks and maximising fire control remain complex inter-related specialisms. Both remain highly reliant on accurate, coherent and up-to-date information about different factors that affect the frequency and ferocity of forest fires.

Knowledge about the amount of vegetation in a forest and its condition helps to identify areas that experience difference degrees of fire risks. For instance, in lower risk forests the trees are well-spaced with high branches, undergrowth is relatively clear and there are access roads nearby.

These types of variables are used to classify fire indicators such as 'forest fuel' volumes. Obtaining knowhow about forest fuel can be complicated since vegetation is not static and continues growing each year. Good practice approaches to forest management therefore includes the use of fuel maps, yet the cost of updating such maps can be a barrier to their use.

The Greek-led ArcFuel project (**LIFE10 ENV/GR/000617**) attracted teams from several Mediterranean countries to share their expertise and ideas for reducing forest fire risks. Their goal was to develop a common tool for creating high definition and low cost forest fuel maps.

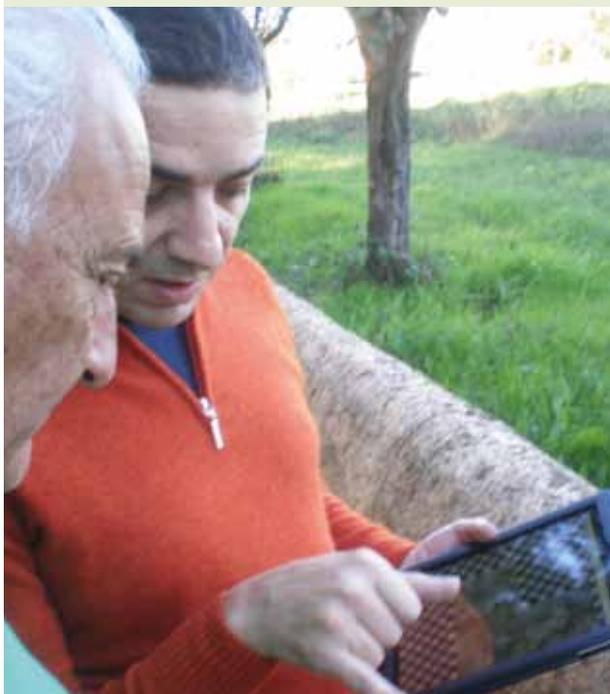


Smart phone app

Following completion of the project, the ArcFUEL team has developed a smart phone app ('FuelMap') to support consistent collection of forest vegetation data in the field in order to validate forest fuel maps.

The app is already popular with forest and fire management authorities. Users create a list of points that they wish to survey in the target woodland and the app allows them to download Google Maps tiles for those locations. In the forest, FuelMap can direct the user to the specified survey plot. The user then enters in-situ data about the structure of the plot.

Details and photos such as vegetation form, vegetation type, height, and density can be collated directly through the app's geo-referenced records. There is also the flexibility to add extra ad hoc survey data.



Building on the JRC's work

The project was divided into three stages, as outlined by Luis Mario Ribeiro, a researcher at Portugal's Forest Fire Research Centre of ADAI, a project partner. The first stage involved developing vegetation maps based on satellite imagery and ancillary data, such as topography or land use maps. This was followed by an extensive fieldwork survey, after which the project team established rules for creating a semi-automatic process of transforming these vegetation maps into fuel maps.

ArcFuel's aim was to create fuel maps for the whole of Portugal and Greece and for one pilot area in each of Italy and Spain. "At a later stage we intend to extend to all Europe," says Mr Ribeiro.

The project capitalised on research from the European Joint Research Centre about fuel classification schemes for Europe's forest regions. An 'add-on' methodology was developed with an associated workflow through freely available European spatial datasets and Landsat images. "The maps are presented in a format easily recognisable by any GIS and can then be incorporated into any management system that the user wishes," explains Mr Ribeiro.

Replicable results

"ArcFUEL provides a methodological 'plug-in' that feeds already available fire propagation models with up-to-date and accurate fuel maps contributing in a significant way to forest fire management, situation awareness and crisis management," explains project manager Markos Bonazountas. "ArcFUEL's digital and printed maps can be directly introduced to stakeholders' activities covering some of their daily operational needs such as forest fire risk analysis and situation awareness," he adds.

ArcFuel engaged forest fire brigades, civil protection authorities, public sector foresters and other stakeholders in its quest for common systems that, in line with the INSPIRE Directive, could be "easily reused, visualised and exploited by any interested partner or community," says Prof. Bonazountas.

In the interests of replication, the project developed an advanced online geoportal that allows users to retrieve information regarding the distribution of vegetation type according to the fuel quantity and dryness.

Fuel maps are very important input datasets in fire simulation, propagation and risk analysis algorithms," explains Prof. Bonazountas. "Our development of an ex-novo methodology for the semi-automated extraction of fuel maps in high resolution (at 50 m) and the definition of fuel parameters in Europe and worldwide was extremely worthwhile," he concludes.

Project number: LIFE10 ENV/GR/000617

Title: ArcFUEL - Mediterranean fuel maps geodatabase for wildland & forest fire safety

Beneficiary: EPSILON International, SA

Contact: Prof. Markos Bonazountas

Email: bonazountas@epsilon.gr

Website: www.arcfuel.eu/

Period: 01-Oct-2011 to 30-Sept-2014

Total budget: €1 306 000

LIFE contribution: €653 000



Italy: Creating a secondary market for local waste

This model circular economy project enabled the prevention, re-use and recycling of waste through public-private partnerships in the city of Ferrara.

Some 3 billion tonnes of waste are thrown away in the EU every year. The LOWaste project addressed this problem in Ferrara, Italy, developing local markets to recycle or reuse textiles, inert building waste, urban furnishings, play equipment and food residues.

Central to the project was the creation of a local 'green district' based on circular economy principles. This consisted of waste operators, small re-use and recycling platforms, artisans and SMEs engaged in developing and making products from recovered materials.

To carry out the project, the Municipality of Ferrara worked with social cooperative La Città Verde, Impronta Etica, a network of Italian companies engaged in the promotion of Corporate Social Responsibility, RREUSE, a European network of social enterprises that operate in the recovery and recycling of waste, and the local utility company, HERA.

The first step involved analysis of waste legislation (including regulatory constraints), waste management methods

and waste actors in Ferrara, a city of some 350 000 people. After assessing waste fractions to identify ones with potential high added value, pilot projects were initiated to recover each of those fractions and create a circular chain of players able to create and market so-called 're-products' made from these fractions both locally and regionally. In support of this work, the Municipality of Ferrara developed a green procurement programme that linked buying procedures to the eco-design of products.

Pilot actions

The textiles pilot involved 23 designers and makers who turned some 90 tonnes of clothing from surgical operating theatres into a range of goods, including shoes, bags, cushion covers and gadgets.

In the second pilot, construction and demolition aggregate waste was used as a foundation material in roadbuilding. To support this action, in January 2014, Ferrara established minimum environmental criteria for the construction and

LOWaste involved 23 designers who turned 90 tonnes of textiles into a range of goods, such as bags





Thirty tonnes of food waste were converted into 4.5 tonnes of compost

maintenance of green roads. Later the same year, the LoWaste team carried out trials on 1.5 km of road made using recycled aggregates, reusing some 4 090 m³ of this waste.

A second element of this pilot saw private sector construction partners mix the aggregate waste with cement in prototype panelling for the exterior of buildings.

The third pilot involved designers reconditioning street furniture and playground equipment into children's furniture. In the final trial, the project team took food scraps and used cooking oil from fairs and festivals and turned it into compost, biodiesel and glycerine. Thirty tonnes of food waste was converted into 4.5 tonnes of compost for use in the gardens of a school. The partners also carried out a feasibility study into the reuse of food waste from school canteens.

As part of the pilot phase, the project partners also designed a reuse centre for Ferrara, where citizens and companies could deposit unwanted items so they can be repaired and reused.

“LoWaste for Action” was a community engagement process to develop value chains for the materials recovered

A LoWaste value chain is:

1. Circular: Waste is the start point for new production.
2. Local: Takes place within a limited area.
3. Has proven and measurable environmental and social benefits.

through the pilot projects. To build partnerships, there was a call for expressions of interest by potential actors in the production chain, followed by an intensive co-design phase and the presentation of results. This resulted in proposals for seven scalable projects and 13 product prototypes from the 58 participants.

Sustaining the Green District

All four “re-products” markets have generated a series of environmental benefits. These include a reduction in direct waste in Ferrara of 11 400 tonnes/yr. The project calculates that using secondary raw materials will save some 11 200 tonnes/yr of raw materials. Other estimated benefits include lower greenhouse gas emissions (some 3 000 tonnes/yr of CO₂) and a 230 000 m³ reduction in the city's water footprint.

Project partner Città Verde is continuing to reuse the four waste streams piloted by the project within Ferrara's Green District. To further consolidate the waste management approach developed during the project, the Municipality of Ferrara has signed a Memorandum of Understanding (the “LOWaste agreement”) with the project partners and other local companies and organisations to strengthen the existing LoWaste supply chains and encourage new local markets for recycled or reused material.

The project team is continuing to communicate its results to encourage the creation of similar districts in other territories. To support this goal, LoWaste and other EU-funded waste management projects made a joint submission to the Italian government requesting the reform of the country's waste regulations so as to overcome legislative barriers that are slowing the growth of the circular economy.

In conclusion, project manager Lara Sitti says: “Through active stakeholder participation and public-private partnership, the LoWaste project showed that it is possible to activate short circular chains even without public subsidies to add value to ‘worthless’ waste fractions.”

Project number: LIFE10 ENV/IT/000373

Title: LOWaste - Local Waste Market for second life products

Beneficiary: Municipality of Ferrara

Contact: Lara Sitti

Email: lsitti@comune.ferrara.it

Website: www.lowaste.it/en

Period: 01-Sept-2011 to 30-Jun-2014

Total budget: €1 109 000

LIFE contribution: €555 000



Malta: Water-saving solutions for enterprise

The Investing in Water project is helping hotels and other businesses in Malta to reduce their water consumption by over 141 million litres per year.

Malta doesn't have enough freshwater to meet its needs. Practically all of its naturally occurring freshwater is stored in groundwater springs and wells that are threatened by nitrate pollution and over-extraction. Estimates indicate that there is less than 60 m³/yr per capita of sustainably available groundwater and harvested rainwater available. This makes Malta by far the most water scarce country in Europe and amongst the 10 most water-stressed nations in the world.

Climate change also poses an additional threat to the groundwater sources of Mediterranean islands such as Malta. Thus, awareness-raising on key issues – e.g. mitigation and adaptation to climate change, EU water policy, desalination techniques and best practice solutions – could play a major role in encouraging the adoption of strategies and tools for saving water and reducing water consumption.

Adopting water-saving behaviour

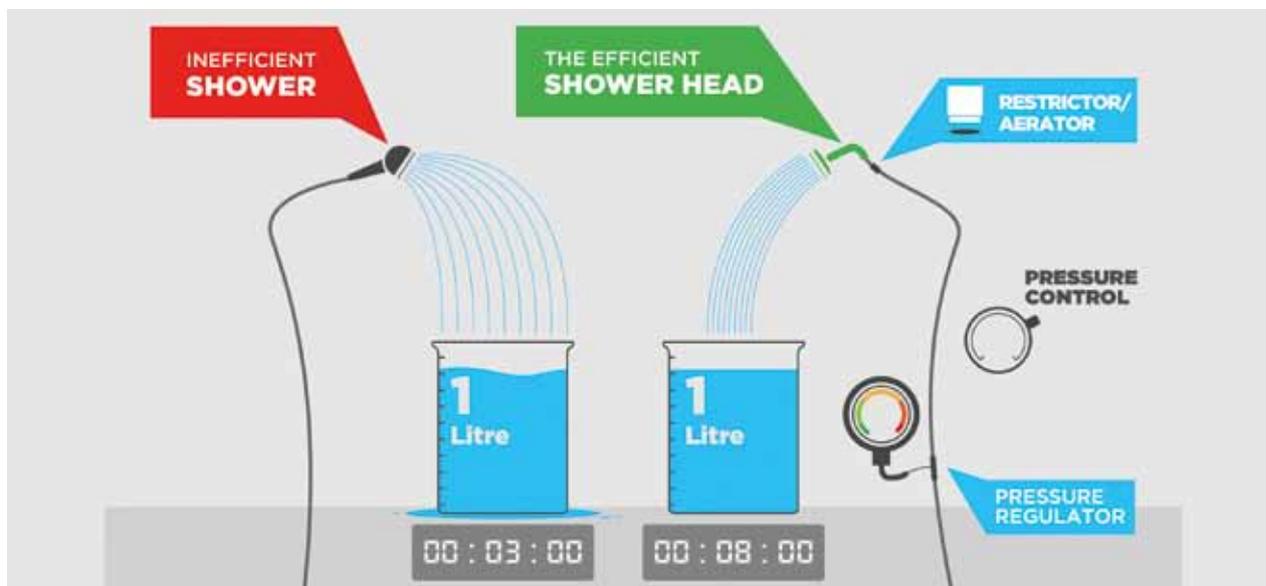
Against this background, the main objective of the LIFE Information & Communication project, Investing in Water

(LIFE10 INF/MT/000091) was to achieve changes in behaviour, leading to increased adoption of best practices for saving water amongst Maltese businesses, most notably hotels. By influencing target economic sectors, the project believed that other sectors would also be encouraged to adopt water-saving measures – thereby helping to reduce pressure on groundwater and contributing to the Member State's obligations to achieve good water quality status under the Water Framework Directive (WFD - 2000/60/EC).

The project was coordinated by the Malta Business Bureau (MBB), the project beneficiary, with support from the Malta Hotels & Restaurants Association and Malta Chamber of Commerce, Enterprise and Industry. Over a two-and-a-half-year period, Investing in Water targeted 186 general businesses, employing a total of 23 000 people. Some 72 hotels were also approached, employing another 6 500 people.

Awareness-raising focused on five main areas: obligations under the WFD; water scarcity (over-extraction of groundwater); the economic and environmental cost (i.e. carbon footprint) of producing water from desalination plants; the

The project designed water-saving devices for enterprises





potential impact of anticipated climate change scenarios on groundwater; and best practices for companies, especially hotels, to reduce their water consumption.

Through a series of information campaigns and audits, the project team demonstrated that target stakeholders can contribute to the reduction of water (and energy) consumption in Malta.

The strategy encouraged direct contact with enterprises as a means of gathering information, identifying water-saving opportunities and encouraging their adoption. To further build a drive towards water saving by industry, media and communications work was used on an ongoing basis throughout the duration of the project. By identifying a good contact person within each enterprise, the LIFE team was also able to successfully carry out its media work effectively, and react quickly to developments. Furthermore, the project team worked hard at maintaining good links with stakeholders, including government authorities.

Best practice brings significant savings

Full details of all the best practice water-saving solutions for reducing water consumption are provided on the Investing in Water website (see link below). The project identified excessive flow rates in showers and hand wash basins, excessive toilet flushing volumes, rainwater harvesting, and grey and black-water treatment as the water saving measures with 'the most potential locally'.

The team also carried out audits of the 136 enterprises – helping them to implement these solutions. The project identified, for instance, a “strong element of over-design” in water-consuming facilities. Showers in hotels audited, for example, had flow rates as high as 30 l/minute; whilst some toilets in business premises had flushing volumes of 15l. Based on its experiences, the project recommended that flow rates of 7l/min would be sufficient even for showers say, in a five-star luxury hotel. In addition, it found most toilet models could easily be retro-fitted to use just 6l/min per flush.

By the project's end, companies that had adopted water-saving measures were saving an estimated 141 million litres of water annually – enough to supply the needs of two medium-sized four star hotels and three large factories.

These savings were announced at the project's closing event held on 28 March 2014 in Valletta. Commenting on the importance of rainwater harvesting for offices and factories, Anton Borg, president of the Malta Chamber of Commerce, Enterprise and Industry said: “The project has helped individual enterprises reduce their consumption by 30% through rainwater harvesting. More importantly, analysis of all the factories collaborating



Photo: EC - Patrick Mascant

Karl Falkenberg presents members of the Investing in Water team with their LIFE Environment Best Project award

with the project showed that rainwater could meet the needs of around 50% of industry's current consumption.”

Konrad Mizzi, Malta's Minister for Energy, under whose portfolio water conservation falls, commented: “This project is a good example of demand management and stakeholders taking direct and independent action to contribute to reducing demand. Results showed that big savings are possible, even in industry.”

Importantly, some of the enterprises involved are still in the process of planning or implementing water-saving measures. Therefore, the amount of water saved in the long term is expected to increase further.

Project leader Joe Tanti of MBB says the Investing in Water's 'Best' project award is a “credit to the enterprises collaborating with the project, who have recognised that environment measures make business sense.” According to project manager, Geoffrey Saliba, “The enthusiasm with which businesses, hotels, and industry stakeholders welcomed the project, and the action that they took with the project partners, allowed such significant savings. This award is affirmation of the effectiveness of these parties' joint action to tackle Malta's water scarcity problem through the project.”

Project number: LIFE10 INF/MT/000091

Title: Investing in Water - Achieving Reduction in Water Consumption by Business in Malta

Beneficiary: Malta Business Bureau

Contact: Joe Tanti

Email: ceo@mhb.org.mt

Website: www.investinginwater.org/

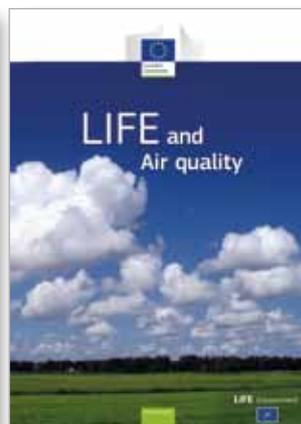
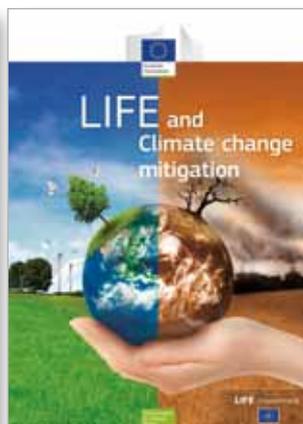
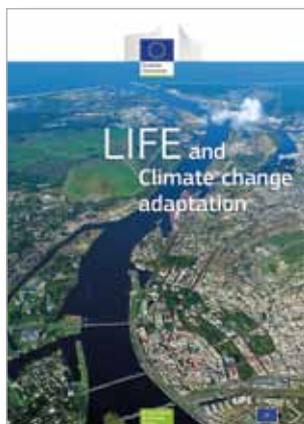
Period: 01-Oct-2011 to 31-Mar-2014

Total budget: €314 000

LIFE contribution: €157 000



Available LIFE Environment publications



LIFE Environment brochures

LIFE and Climate change adaptation (2015, 116 pp. – ISBN 978-92-79-52308-3 – ISSN 1725-5619)

LIFE and Climate change mitigation (2015, 92 pp. – ISBN 978-92-79-43946-9 – ISSN 1725-5619)

LIFE and Air quality (2014, 76 pp. – ISBN 978-92-79-38304-5 – ISSN 1725-5619)

LIFE and Soil protection (2014, 68 pp. – ISBN 978-92-79-38305-2 – ISSN 1725-5619)

LIFE creating green jobs and skills (2013, 76 pp. – ISBN 978-92-79-25091-0 – ISSN 1725-5619)

LIFE's Blueprint for water resources (2012, 80 pp. – ISBN 978-92-79-27206-6 – ISSN 1725-5619)

LIFE and coastal management (2012, 96 pp. – ISBN 978-92-79-25091-0 – ISSN 1725-5619)

LIFE and Resource Efficiency: Decoupling Growth from Resource Use (2011, 72 pp. – ISBN 978-92-79-19764-2 – ISSN 1725-5619)

LIFE and local authorities: Helping regions and municipalities tackle environmental challenges (2010, 60 pp. – ISBN 978-92-79-18643-1 – ISSN 1725-5619)

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LIFE among the olives: Good practice in improving environmental performance in the olive oil sector (2010, 56 pp. – ISBN 978-92-79-14154-6 – ISSN 1725-5619)

Getting more from less: LIFE and sustainable production in the EU (2009, 40 pp. – ISBN 978-92-79-12231-6 – ISSN 1725-5619)

Breathing LIFE into greener businesses: Demonstrating innovative approaches to improving the environmental performance of European businesses (2008, 60 pp. – ISBN 978-92-79-10656-9 – ISSN 1725-5619)

LIFE on the farm: Supporting environmentally sustainable agriculture in Europe (2008, 60 pp. – ISBN 978-92-79-08976-3 – ISSN 1725-5619)

Other publications

Best LIFE Environment projects 2013 (2014, 68 pp. – ISBN 978-92-79-40171-8)

Environment Policy & Governance Projects 2013 compilation (2014, 134 pp. – ISBN 978-92-79-37961-1)

Information & Communication Projects 2013 compilation (2014, 12 pp. – ISBN 978-92-79-37957-4)

Best LIFE Environment projects 2012 (2013, 48 pp. – ISBN 978-92-79-32961-6 – ISSN 1725-5619)

Environment Policy & Governance Projects 2012 compilation (2013, 157 pp. – ISBN 978-92-79-29479-2)

Information & Communication Projects 2012 compilation (2013, 14 pp. – ISBN 978-92-79-29475-4)

Best LIFE Environment projects 2011 (2012, 24 pp. – ISBN 978-92-79-28217-1 – ISSN 1725-5619)

Environment Policy & Governance Projects 2011 compilation (2012, 122 pp. – ISBN 978-92-79-25247-1)

Information & Communication Projects 2011 compilation (2012, 17 pp. – ISBN 978-92-79-25248-8)

Best LIFE Environment projects 2010 (2011, 32 pp. – ISBN 978-92-79-21086-0 – ISSN 1725-5619)

Environment Policy & Governance Projects 2010 compilation (2011, 113 pp. – ISBN 978-92-79-20030-4)

Information & Communication Projects 2010 compilation (2011, 19 pp. – ISBN 978-92-79-20027-4)

Best LIFE Environment projects 2009 (2010, 32 pp. – ISBN 978-92-79-16432-3 – ISSN 1725-5619)

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

<http://ec.europa.eu/environment/life/publications/lifepublications/index.htm>

A number of printed copies of certain LIFE publications are available and can be ordered free-of-charge at:

<http://ec.europa.eu/environment/life/publications/order.htm>

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

The LIFE programme is the EU's funding instrument for the environment and climate action

Period covered 2014-2020

EU funding available approximately €3.46 billion

Allocation of funds Of the €3.46 billion allocated to LIFE, €2.59 billion are for the Environment sub-programme, and €0.86 billion are for the Climate Action sub-programme. At least €2.8 billion (81% of the total budget) are earmarked for LIFE projects financed through action grants or innovative financial instruments. About €0.7 billion will go to integrated projects. At least 55% of the budgetary resources allocated to projects supported through action grants under the sub-programme for Environment will be used for projects supporting the conservation of nature and biodiversity. A maximum of €0.62 billion will be used directly by DG Environment and DG Climate Action for policy development and operating grants.

Types of projects Action Grants for the Environment and Climate Action sub-programmes are available for the following:

- > "Traditional" projects – these may be best-practice, demonstration, pilot or information, awareness and dissemination projects in any of the following priority areas: LIFE Nature & Biodiversity; LIFE Environment & Resource Efficiency; LIFE Environmental Governance & Information; LIFE Climate Change Mitigation; LIFE Climate Change Adaptation; LIFE Climate Governance and Information.
- > Preparatory projects – these address specific needs for the development and implementation of Union environmental or climate policy and legislation.
- > Integrated projects – these implement on a large territorial scale environmental or climate plans or strategies required by specific Union environmental or climate legislation.
- > Technical assistance projects – these provide financial support to help applicants prepare integrated projects.
- > Capacity building projects – these provide financial support to activities required to build the capacity of Member States, including LIFE national or regional contact points, with a view to enabling Member States to participate more effectively in the LIFE programme.

Further information More information on LIFE is available at <http://ec.europa.eu/life>.

How to apply for LIFE funding The European Commission organises annual calls for proposals. Full details are available at <http://ec.europa.eu/environment/life/funding/life.htm>

Contact

European Commission – Directorate-General for the Environment – B-1049 Brussels (env-life@ec.europa.eu).

European Commission – Directorate-General for Climate Action – B-1049 Brussels (clima-life@ec.europa.eu).

European Commission – EASME – B-1049 Brussels (easme-life@ec.europa.eu).

Internet <http://ec.europa.eu/life>, www.facebook.com/LIFE.programme, twitter.com/life_programme, www.flickr.com/photos/life_programme/.

LIFE Publication / Best Environment projects 2014

