
European Commission
LIFE
greening jobs
and growth
LIFE Environment
Environment

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Foreword

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Innovation is driving the transition towards a circular, resource efficient and low carbon economy. This offers opportunities for growth and jobs in Europe. The global market for eco-industries was estimated at roughly €1.15 trillion a year in 2010 and could reach €2 trillion a year by 2020.

The EU has a strong export position in this field. The Circular Economy Package adopted by the European Commission in December 2015 will generate business opportunities and jobs in new and expanding sectors, such as recycling, as well as in innovative services such as product leasing. Additionally, meeting the targets of the 2030 climate and energy framework could create an additional 700 000 jobs by 2030.

In most cases, the transition to a circular economy will mean evolution in the workplace. Existing occupations will be adapted to meet the new demands and employees will adopt new skills to complement existing ones. The effects on employment of the transition to a green economy are already visible with more jobs at all levels requiring new qualifications, and in particular more 'green skills'. In this context, employment services will play a crucial role in matching skills to jobs and providing training.

As the stories in this brochure show, LIFE is contributing to the spread of green skills and the creation of green jobs in a broad range of sectors:

- *LIFE is also helping to maintain Europe's 'first mover advantage' in green technology, as shown by the success of projects such as DYEMOND SOLAR, whose innovative solar cells address the challenge of climate change.*
- *LIFE has created green jobs that point the way to a greener future in our cities, from sustainable building to green banking to water treatment.*
- *LIFE is also contributing to blue growth at sea and in coastal communities and to smart, sustainable and inclusive growth in rural areas. LIFE Nature & Biodiversity projects make such a key contribution to the Natura 2000 network of protected areas.*
- *LIFE aims at conserving ecosystem services and in doing so it protects and creates jobs. LIFE projects such as Laurissilva Sustentavel, which has created new employment in site management and eco-tourism in peripheral areas of Madeira, demonstrate the positive impact the programme can have.*
- *LIFE offers opportunities to those who are not yet active in the job market, including the socially disadvantaged, to do volunteering work that fulfil many of the goals of the new European Solidarity Corps.*

Karmenu Vella
European Commissioner for Environment, Maritime Affairs and Fisheries

LIFE, green jobs and green skills

LIFE is a driver for green skills and jobs. The programme, now in its 25th year, has fostered skills development and created sustainable jobs in many sectors of the economy.

LIFE is a catalyst for investments in innovative green businesses that will help generate more jobs, both directly and indirectly. Replication of successful projects and ideas can lead to further green growth.

LIFE funding has supported the upscaling of technologies and the replication of techniques which have had a positive impact on employment, generating jobs for unskilled, semi-skilled and skilled workers, as well as highly-qualified specialists. These jobs range from people doing planting and clearance work in conservation areas, to those who repair goods in reuse centres to engineers using advanced electrochemical processes in wastewater treatment plants, architects specialised in sustainable buildings, builders qualified to recover gypsum waste and jobs in organic aquaculture.

LIFE has helped in identifying skills gaps in the labour force and has successfully worked with universities and training institutions to fill them. The range of green skills advanced by LIFE projects covers the gamut from the repair of electrical goods for reuse, to new river restoration techniques, sustainable building concepts for architects, new knowledge on wastewater treatment techniques for chemical engineers, to practical and commercial skills needed to develop a sustainable farming business in cities.

LIFE, jobs and the circular economy

The transition to a circular economy where resources are reused as much as possible will be one of the defining features of the coming decades, driven by the need to live well, within the limits of our planet. LIFE projects are contributing to this transition, demonstrating their potential to create jobs and upskill the workforce[1].

LIFE is also helping to tackle unemployment and depopulation in rural and peripheral areas, including coastal communities, creating and safeguarding jobs in farming by spreading skills in organic or conservation farming, or indirectly supporting the growth of eco-tourism. Projects such as PRISCA have enabled socially disadvantaged individuals to find work. LIFE is also helping the young and unemployed through its many opportunities for volunteers, who play a vital role in support of many projects.

In cities, LIFE projects have contributed to the spread of green jobs and skills in a host of areas, including housing, building, transport, waste management and commerce. Jobs building green infrastructure or running city farms have the added benefit of making our cities healthier, more liveable and more resilient to climate change, while increasing urban biodiversity.

Water is vital to life, and LIFE has long recognised the value of ensuring good water quality and avoiding water scarcity. Job creation through projects focusing on water includes people working in river and wetland restoration. Such actions require everyone from manual labourers and volunteers to skilled water resource engineers with specialist knowledge in restoration techniques, flood risk management, spatial planning, economics and habitat conservation.

In water treatment companies, LIFE has required chemical engineers to learn new skills as a result of the implementation of improved innovative techniques pioneered by projects.

LIFE and Natura 2000

LIFE Nature projects have shown how the management and restoration of protected areas in the Natura 2000 network requires numerous practical interventions. Restoration activities cover a wide range of jobs and skills from manual labour to specialised professions such as engineers and hydrologists. With a growing recognition of the importance of natural capital, LIFE is now developing new skills and associated employment in fields such as mapping the ecosystem services provided by protected areas. Protecting those services helps to safeguard or increase employment in tourism, recreation, agriculture, fishing and other areas of the

economy that depend on them. LIFE Nature projects also maintain existing rural employment by supporting the continuation of favourable land uses, such as low intensity traditional farming or forestry.

Enabling blue growth

Appropriate development of fisheries, aquaculture and other maritime sectors will play an important role in achieving EU goals for smart, sustainable and inclusive growth by 2020.

The LIFE programme has made valuable contributions to fostering innovations that are opening up new opportunities to make best use of Europe's oceans, seas and coasts for employment and sustainable economic growth. LIFE is also helping to create the diverse range of jobs and skills needed for the future growth of the blue economy.

For instance, around 300 LIFE projects have enhanced marine and coastal management, and reduced pollution, to facilitate growth in marine and coastal tourism. Other projects have shown how to make aquaculture more sustainable or how to make use of fishing discards, opening up new income streams for fishing communities.

A greener future

Renewable energy is the main source of green jobs in the EU. LIFE projects working to help us meet climate and energy targets have created new roles in the production of innovative solar cells, biomass chains or electric vehicles for personal and public transport.

LIFE projects illustrate that there are various drivers of green jobs and skills. In some cases, policy and regulation orient a sector towards a 'green restructuring'. Green jobs and skills can also be market-driven. One of LIFE's major contributions to the greening of the EU job market has been by means of the dissemination of green skills through training courses and practical guidelines. One lesson from completed projects is that training needs to be structured and sustained, with support at regional/national level. As LIFE has shown, the involvement of universities, vocational training and other tertiary education institutions is vital to ensure people have the green skills needed for the workplace of the very near future.

A study published by LIFE earlier this year demonstrates the programme's considerable impact on job creation and growth. LIFE: Contributing to Employment and Economic Growth[2], which was co-authored by the LIFE external monitoring team (Neemo) and Ernst & Young (Prague), explores the sustainability, replicability and economic impact of projects, as well as highlighting options for green finance.

The study found that for an initial investment of €2.1 billion, LIFE has contributed an estimated €9.3 billion to the European economy. It also showed that in addition to direct contributions to employment and growth, LIFE Nature projects have a 'hidden' added value in terms of ecosystem services (e.g. providing us with clean air and water, flood protection, climate stabilisation, and recreation and eco-tourism). Based on a sample analysis of 25 projects, the monetisation of ecosystem services for all LIFE Nature projects was estimated as contributing a further €43 billion to the European economy.

The average LIFE project was found to create 31 person-years in full-time equivalent (FTE) jobs: 21 directly and the rest indirectly. Therefore, 1 000 projects would create a total of 31 000 jobs during project implementation, with at least 43 500 more jobs in the five years after the start of project replication, based on the most conservative replication scenario used.

1. See LIFE and the Circular economy: http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/circular_economy.pdf

2. http://ec.europa.eu/environment/life/publications/lifepublications/generalpublications/documents/jobs_growth_study.pdf

Green jobs for a greener future

Photo: EU/Tiziana Fabi

Daniel Calleja Crespo is the European Commission's Director-General for Environment. In this article, he talks about how LIFE can contribute to the 'Juncker Plan' for jobs and growth.

"EU Green Week 2017 (29 May-2 June) is on the theme: 'Green jobs for a greener future'. Green Week will focus on how EU environmental policies are creating green jobs and contributing to economic, sustainable and socially responsible growth in the EU. It will also highlight the demand for new types of green skills in many professional sectors.

EU policies, in particular the Circular Economy Package adopted in December 2015, are helping to make the transition towards a circular economy a reality. This will encourage fundamental changes across the entire EU economy, including the labour market. As companies develop new, sustainable business models, expand their markets and adapt innovative solutions to efficiently use resources, this can translate into more jobs.

The EU's developing green economy has proven itself to be resilient, and has seen sustained job growth in recent years. The European eco-industry employed around 2.2 million people in 2000. Now, it employs over 4.2 million people."

Developing green skills

"The transition to a green economy requires new skills. Such skills are needed both to 'green' existing jobs and to do new types of work. This will require adjustments to the current training and qualification frameworks for some occupations.

Skills gaps and shortages are already recognised as a major bottleneck in a number of green sectors, such as renewable energy. These gaps, which affect SMEs in particular, are challenging. At the same time, they provide an opportunity to establish new and useful occupations. Adaptation of education and training systems is therefore an essential element in enabling a successful transition towards a circular economy."

How is LIFE contributing?

"LIFE is helping to create jobs and develop green skills across the EU. This is happening at all skills levels - from highly-qualified architects, chemical engineers and ecologists to skilled manual labour (e.g. builders, ship dismantlers, park wardens, aquaculturalists) to low-skilled labour in centres for reuse and recycling.

Many of the new jobs in cities are linked to the circular economy: from people making a living repairing bulky waste, to workers dismantling rather than demolishing buildings so that material can be recycled. The new Integrated Project LIFE-IP CIRCWASTE-FINLAND will establish a national centre for the circular economy as part of its mission to implement the country's National Waste Plan. This will help build capacity to keep materials circulating in the economy for longer. LIFE-IP CIRCWASTE-FINLAND is an example of how the large scale LIFE Integrated Projects can have a considerable leverage effect on environment results and on employment and job creation.

LIFE is also contributing to the financial, transport and water treatment sectors. Building on our small initial investments in projects, companies are often able to attract green financing to commercialise innovations and develop their businesses and workforce.

LIFE's job creation isn't confined to cities. Coastal communities have benefited through the programme's support for blue growth in sustainable aquaculture, maintenance of artisanal salt production, reuse of bycatch and whale-watching, among other forms of enterprise."

Building Europe's natural capital

"Rural unemployment is a particular challenge in Europe. LIFE's contribution to local employment in rural or disadvantaged areas should not be overlooked. This is important for social reinsertion and territorial cohesion.

A study on the economic benefits of the Natura 2000 network of protected areas highlights the economic value of different types of ecosystem services, including carbon storage, protection against natural hazards – potentially significant cost savings and a reduction in damage caused by extreme weather events – as well as food security and provision.

Other valuable ecosystem services provided by Natura 2000 include water purification and provision through natural filtration and the potential positive effects on overexploited fish stocks of marine protected areas.

Preliminary results indicate that the economic benefits derived from the Natura 2000 network compare very favourably to the costs associated with managing and protecting this important resource. LIFE Nature & Biodiversity projects in particular make a significant contribution to Natura 2000 site management, highlighting the economic sense that underpins the LIFE programme."

The EU's 28 000 protected areas are also important sources of jobs, both directly - through site management and restoration work, or by enabling the continuation of traditional land uses, sustainable production and recreation - or indirectly, such as through spending on other activities by tourists attracted to visit a conservation area, or downstream processing of sustainably-managed crops, fish or timber."

Maintaining Europe's competitive advantage

"Europe has effectively de-linked economic growth from CO_2 emissions over the last 25 years. Our enterprises tend to consume less energy and raw materials to produce goods than competitors in other parts of the world, though there is room to become even less resource-intensive. Europe's capability in green technology - from the next generation of solar cells (see page 43) to methods of turning waste into a resource (see page 38) to green infrastructure in protected areas and our cities - is a significant competitive advantage that we need to leverage. Employment in environmental goods and services grew 24% between 2007 and 2013, despite the economic crisis. It is vital for the EU's competitiveness to maintain this 'first mover advantage'. The LIFE programme has a key role to play in helping to achieve this goal."

LIFE and the European Solidarity Corps (ESC)

"LIFE has long offered people an opportunity to develop useful skills by volunteering with projects, including the socially disadvantaged. Now it will also contribute to the European Solidarity Corps (ESC). This new initiative from President Juncker gives people under 30 the chance to support an NGO, local authority or private company active in addressing challenging situations across the EU. Rooted in the core EU values of engagement and solidarity, it is hoped that 100 000 young Europeans will be volunteering with the ESC by 2020. This also gives them the opportunity to develop skills that will help them secure work or training afterwards."

LIFE and green jobs in the countryside

LIFE and green jobs in the countryside

EU policy is stimulating the creation of green jobs in nature restoration, green infrastructure, farming, landscape management and eco-tourism. This will ensure a sustainable future for our natural environment and countryside.

The Natura 2000 network of protected areas also contributes to social and economic goals. The network of 28 000 sites has safeguarding Europe's biodiversity as its primary aim. But it is also an important source of employment and can contribute to smart, sustainable and inclusive growth.

People are directly employed to restore and maintain habitats, continue traditional land uses that support protected species or in sectoral activities such as scientific research or recreational activities. Indirect employment linked to the Natura 2000 network includes activities for which sites are catalysts, such as eco-tourism, or support services for conservation (e.g. equipment hire); and downstream activities such as processing fish, using timber, or making honey.

Investing in Natura 2000 management and related activities can have a multiplier effect, causing 'induced employment' in deprived rural and urban areas. The Natura 2000 network has been estimated to support 104 000 jobs directly, and a further 70 000 jobs indirectly, with LIFE playing a fundamental role[3].

Based on a sample analysis of 25 projects, a recent study found that the the monetisation of ecosystem services for all LIFE Nature projects contributes a further €43 billion to the European economy[4].

LIFE Nature project restoration work involves many job types and skill levels, from manual labourers to graduate professionals. Site management typically requires specialist ecologists, conservation managers, ecological consultants, engineers and hydrologists, among others. As LIFE projects have shown, there is a growing need for experts in areas such as beach nourishment and the mapping of ecosystem services to avoid heat stress in urban areas.

LIFE has frequently enabled the return or continuation of appropriate low-intensity traditional farming or forestry - jobs that depend on the ecosystem services they are helping to maintain. Site management activities such as mowing grasslands generate biomass that could supplement farmers' incomes and provide more jobs if burned in a bioenergy plant. As a positive side effect this also helps implement EU policy on renewable energy sources.

LIFE has supported jobs in forestry for engineers, foresters (e.g. pruning timber for biomass production), guides, and information and communication staff.

Giving farmers and forestry workers the skills to maintain the services provided by nature is essential. LIFE's contribution can be seen in this chapter, in projects that have provided a template for wider uptake through targeted training. Methods such as precision or organic farming can maintain soil and water quality and help achieve the same yields while raising the farmer's income.

One lesson from agriculture projects is that training needs to be structured, sustained, supported regionally or nationally and involve agronomists. Furthermore, a profitable market for sustainable farmed products (perhaps backed by certification) is crucial to the 'green restructuring' of agriculture.

The importance of eco-tourism in rural areas is shown by projects such as Laurissilva Sustentavel, which has created jobs in an ultra-peripheral region. The future growth of this activity is intimately linked to nature conservation through the branding of the project area as the 'Lands of Priolo' after the protected bird species found there.

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3. http://ec.europa.eu/environment/pubs/pdf/biodiversity/Biodiversity%20and%20Jobs_final%20report.pdf

4. Source: LIFE: Contributing to Employment and Economic Growth – Authors: Neemo / Ernst & Young (Prague) http://ec.europa.eu/environment/life/publications/lifepublications/generalpublications/documents/jobs_growth_study.pdf

> ***"I want to experiment with other varieties of legumes, oilseeds and cereals and see how and what techniques I need to apply to cultivate them."***
> *Luis Ballesteros*

Helping farmers go organic

A mixture of training in traditional farming techniques and expert mentoring by agronomists helped farmers in Spain switch to organic methods, meaning better yields and better soil.

"Farmers are losing out because yields are getting lower as soil fertility decreases," says Mariano Saz Anchuelo, manager of the LIFE project Crops for better soil. "So we thought of demonstrating that organic farming can increase and restore soil fertility in ways that can also be economically beneficial and viable."

Pilot farms took up the challenge of testing organic and sustainable chemical-and-residue-free approaches to growing traditional crops. Agronomists helped the farmers to re-acquire traditional techniques, explaining and demonstrating how to apply them; they were also on hand to provide daily assistance with technical support if needed.

Montse Escutia organised the training, which included sessions teaching the basic principles of organic farming (things such as crop rotation, weed control and certification), as well as workshops on applying traditional farming methods and field visits. She says, "It is important for farmers to know how to manage fertilisation without chemical fertilisers, the control of weeds without herbicides, and the control of pests and diseases without pesticides.

"Once farmers are familiar with the techniques at their disposal, they have to experiment and adjust them to their reality. That is why subsequent technical advice and support from agronomists is so important."

Luis Ballesteros is one of the farmers who benefited. "Before the project we used a lot of chemical products to cultivate crops on our farm. The LIFE project training and support of the agronomists taught me about crop rotation and now I am sowing leguminous plants as well as wheat."

He achieved positive results applying several of the project's techniques, such as soil decompaction, using flexible harrowing equipment, and intercropping to improve soil quality.

"I was doubtful about the size of the yields," recalls Mr Ballesteros. "I was proven wrong and the wheat quality is much higher with organic plants. They are also worth more on the market."

The farmers highlighted the value of the work of project agronomists such as Professor Juan Pablo del Monte, Professor of Botany at the Polytechnic University of Madrid.

"We need the continuous practical support of the agronomists to guide us and tell us things like whether we should try to apply a bit more organic fertiliser to our crop or which varieties to try out," says Mr Ballesteros. He adds that the consultancy role of the agronomists is "essential for the further development of organic farming techniques."

"When the farmers see the results of the first harvests they are full of excitement and want to learn more," says Professor del Monte.

Mr Ballesteros certainly sees the potential that his new knowledge offers: "I want to experiment with other varieties of legumes, oilseeds and cereals and see how and what techniques I need to apply to cultivate them."

As more farmers understand the benefits of going organic, the more opportunities there will be for agronomists to work alongside and guide them.

Making the most of manure

A LIFE project in Aragón set up several companies to deal with pig slurry, bringing a variety of new jobs to the region.

Photo: NEEMO EEIG/Gabriela Camarsa

"I had to learn about new technology, creative thinking, innovation tools …"
Fernando Ederra

Photo: Sodemasa

Fernando Ederra manages the Tauste Swine Waste Management Enterprise (SWME), one of the companies created to form a bridge between pig farmers and arable farmers. "My job is to oversee the whole management system for pig slurry for the area of Aragón, ensuring that agreements are reached between pig farmers and arable farmers and that the slurry is treated and distributed appropriately and efficiently," he explains.

The ES-WAMAR project introduced a management model to take the slurry to where it is needed and reduce the nutrient burden on small areas of land. Matching up supply and demand for the slurry provides a cheap disposal option for pig farmers and inexpensive non-chemical fertiliser for arable farmers.

Mr Ederra has a degree in Agricultural Engineering from the Public University of Navarra, but his new role still required specific training to develop new green skills: "All the jobs I have had have been related to agriculture. In my previous job I was working for an animal food factory, responsible for computerised management of the pig farms. However, this new role [was quite different] and I had to learn about new technology, creative thinking, innovation tools, SWOT analysis, and so on. I had a month of training in 'Specialisation in Innovation Management'."

The Tauste SWME is one of three set up in Aragón by the LIFE project ES-WAMAR. "The project created jobs for local people including highly-skilled positions such as local coordinators, as well as foremen, plant operators, tractor and lorry drivers, salespeople and clerks," explains Arturo Daudén Ibáñez, who managed ES-WAMAR on behalf of the Environmental Development Society of Aragon (formerly SODEMASA, now known as SARGA).

Some of these also needed to learn new green skills, mostly provided by SARGA's experts, like how to use software for managing the pig slurry system. Called GEMA, this includes a database with information from participating pig and arable farmers, so that the coordinators know current production levels of pig waste and can match it to arable land available for fertilisation.

With the help of GEMA, coordinators such as Mr Ederra have learned to analyse the composition of the slurry and work out how much to spread based on the land and type of crop. This information is then communicated to the tractor drivers out in the fields, who enter the data into a computerised spreading system fitted to their vehicles, ensuring the optimum use of this waste as an organic fertiliser.

This manure management system is becoming popular, thanks to the project's success, and the model is being replicated.

A fourth SWME has been set up in Aragón since the LIFE project using the same system. This new company is coordinated by Azucena Crespo Beltrán, who has had to learn about the application of environmental regulations and standards in the management of livestock waste.

Skills acquired in her role include, "knowledge on how to value manure as a fertiliser, to calculate the dose of slurry to be applied, depending on the crop and whether the land is vulnerable to nitrate pollution, and how to use the GEMA software programme."

Pig farming in Aragón has grown by 20% in the past five years. Over 5% of all pigs in Europe are now bred in the region. "Several breeding associations have shown interest in implementing the manure management system" says Eva Herrero, an environmental technician at SARGA who worked on the project

This will likely mean more jobs for technicians who are needed to make the sector more sustainable. "They can act as an advisory intermediate between land farmers and livestock farmers, providing valuable fertilising services based on proper management of manure," notes Ms Herrero.

Upskilling to conservation agriculture

Juan J. Pérez, a Spanish farmer who has participated in the Agricarbon and Life+ ClimAgri projects, shares his experience in combating climate change with agricultural techniques.

"By taking part in the LIFE projects I have upgraded my green skills in farming! Both projects helped me to implement conservation agriculture on our farms. Conservation agriculture not only benefits the farmer, but also the environment. I have seen that the soil has improved in quality and the organic matter content has increased from 1% to 2% thus improving my yields. It has also helped to reduce erosion by 90%, and biodiversity is flourishing: birds and soil fauna are our allies for making real sustainable agriculture. On the financial side, we have been able to reduce operating costs, inputs (fertilisers and pesticides) and equipment maintenance, all by about 10-15%. I also work less: it takes half the time of conventional tillage farming. As a result, now I have more free time to devote to my family!

I am pleased to be helping to mitigate climate change, as in our farm there are fewer greenhouse gases than ever. There is also more organic carbon in our soils, which helps with climate adaptation. As I said, we have avoided soil erosion which is crucial for farming. Soil is the most important capital farmers have, and is something that farmers only realise when it is damaged.

Conservation agriculture has increased the soil moisture, which is really needed for irrigation by rainfall. As a result, we have more stable yields, even better than before. Crop rotation has led, on the one hand, to a reduction in pests and diseases, and on the other, to a reduction in soil compaction. All in all, it has been a positive experience where I have learnt a different way to farm. I have improved yields and soil quality, spent less on inputs and know that through my work I am contributing to reducing climate change! It's a win-win situation."

Conservation and tourism in the Lands of Priolo

By giving a local community in the Azores the skills to restore and protect native laurel forests and peatlands, LIFE has created new jobs and boosted eco-tourism.

The Azores bullfinch *(Pyrrhula murina),* known locally as 'priolo', is an emblematic species of the island chain. Restoring the protected laurel forests the bird calls home is a major undertaking. Recognising the importance of involving the local community in this task, the LIFE project Laurissilva Sustentavel created a highly-specialised field team of full-time workers. Their job involves, "removing invasive plants, growing and planting native plants, and constructing and maintaining walking trails," explains project manager, Joaquim Teodosio. The project also created jobs for a six-person team that coordinates all conservation and monitoring actions.

While some of the field team were already familiar with invasive plant species such as Chilean rhubarb *(Gunnera tinctoria)* and Australian cheesewood *(Pittosporum undulatum)* and the techniques needed to remove them, other hires were trained to possess these skills too.

The economic impact of the project is already apparent. Bullfinch watching and trips to the native forest areas are increasingly popular, especially since the bird's territory was recognised by the European Charter of Sustainable Tourism. Through this recognition new visitors are being attracted to the Portuguese island group, which has led to many companies adopting the 'Lands of Priolo' brand because of the growing potential for eco-tourism and the new jobs it brings. "This demonstrates

Photo: LIFE03 NAT/P/000013/NEEMO EEIG/João Salgado

"These are peripheral and rural areas where it's difficult to attract funds to create new jobs and business opportunities."
Joachim Teodosio

to stakeholders the importance of the conservation work and paves the way for further co-financing from local authorities for new projects," explains Mr Teodosio.

One member of the coordination team is working with the local population promoting the natural values of the territory and more sustainable tourism. Another now works at a Priolo interpretation centre to advance its outreach to schools and visitors.

Without the LIFE funding such openings would not have materialised, believes Mr Teodosio: "These are peripheral and rural areas where it's difficult to attract funds to create new jobs and business opportunities."

Green energy from grass cuttings

PROGRASS exploited biomass from grassland management activities to generate two types of bioenergy and create rural jobs.

Mature grasslands must be mown to optimise biodiversity. But farmers need a financial incentive to manage land in this way. The LIFE project PROGRASS showed that conserving flower-rich grasslands can go hand-in-hand with generating renewable energy and creating rural employment.

It did this by overcoming a technical barrier to using mown grass for bioenergy, as Tim Scholze from project partner BUPNET explains: "The problem was that mowing to optimise biodiversity in mature grasslands creates a "difficult substrate" for bioenergy, due to its high fibre content. The solution was to divide the silage into a liquid fraction for biogas production and a solid fraction to make pellets for combustion."

The first full-scale implementation of this approach, called Integrated Generation of Solid Fuel and Biogas from Biomass (IFBB), created permanent jobs at an existing bioenergy plant in Baden-Baden.

"The potential for job creation is dependent on local situations," says Dr Scholze. "In Baden-Baden, they mainly use green urban waste, as well as cuttings from mature grassland." Follow-up projects after PROGRASS have created a wider range of jobs. "In these projects we are also using grass from roadside verges, and at these locations there is big potential for new jobs for less qualified people."

BUPNET created new jobs spreading the word about the new technology, while the University of Kassel, which coordinated PROGRASS, employed researchers/trainers to teach farmers and others skills for implementation. "It's not only about the technology, it's about creating a Europe-wide network," explains Dr Scholze.

The PROGRASS network is facilitating the construction of IFBB units across Europe. These generate income for farmers, and can attract businesses interested in decentralised energy sources and employment.

LIFE and green jobs in the water sector

LIFE and green jobs in the water sector

Water nourishes our economies, and is vital for sustaining and creating jobs. Water management that delivers safe, reliable and affordable supplies and adequate sanitation improves living standards, expands local and national economies, and leads to greater social inclusion.

Failure to secure adequate water supplies to support water-dependent sectors, on the other hand, can result in negative economic impacts and the loss of jobs. Water resource management also helps protect communities from floods and water scarcity, indirectly safeguarding jobs in sectors such as agriculture and tourism. It is estimated that more than 1.4 billion jobs (42% of the world's workforce) are heavily water-dependent[5].

Direct employment in the water sector falls into three categories: water resource management; building, operating and maintaining water infrastructure; and water-related services. Sustainable water management also drives green growth and the creation of water-dependent jobs in sectors such as agriculture, forestry, fisheries, energy, manufacturing, construction, and recycling.

The LIFE programme has over the last 25 years funded nearly 2 000 projects directly or indirectly related to the water sector. These projects have extended along the water cycle, from the management of groundwater and water resources – including wetland and river restoration - to industrial wastewater treatment. They have developed green skills and created jobs, ranging from manual work for socially disadvantaged people to highly-skilled technical positions.

To alleviate water scarcity LIFE projects have developed new skills in groundwater management and remediation, in tandem with enhancing skills in water-dependent sectors such as agriculture.

Similarly, to maintain freshwater ecosystem services, LIFE projects have taught skills to volunteers and created skilled work in different areas of expertise. Projects have hired water engineers specialised in building artificial wetlands and phytodepuration measures, for example, while LIFE Eislek trained unemployed people to restore wetlands using green skills that enhance their chances of finding permanent jobs.

Creating highly-skilled technical jobs in areas such as water quality, sanitation, and urban and industrial wastewater treatment is a positive side effect of LIFE's core activities. Nearly 250 projects have focused on wastewater treatment; these have helped upgrade existing employees' skills and created positions for specialists and non-specialists alike. For instance, projects such as ReQpro and LIFE WateReuse have enabled engineers to upscale their skills and knowledge in areas such as analytical chemistry, advanced electrochemical processes, automation, renewable energy, environmental legislation and other disciplines.

Innovations in water supply funded by LIFE, including a novel filtration system for drinking water developed by the AFM (Advanced Filtration Management) project, have led to skilled and highly-paid technical jobs for quality control specialists, engineers and industrial chemists. Furthermore, links have been established with universities to map out where green skills are necessary and to fill those gaps with training courses. Investments in the water sector can also lead to more jobs for suppliers and distributors of new treatment technology, such as REMEMBRANE's reconditioned reverse osmosis membranes that make desalination plants more sustainable.

5. World Water Development Report 2016: Water and Jobs. Paris, UNESCO

Upscaling benefits to the environment and the economy

Funding to develop technology can really transform a business, build its expertise, and bring about a major green development, as shown by the story of AFM – Advanced Filtration Management – which uses recycled glass to filter water.

Photo: Dryden Aqua

> ***"We're doing a huge amount of R&D with the scale up of the production facility… all the water for Guinness in Ireland is filtered by our product."***
> *Howard Dryden*

Dryden Aqua Limited, the project beneficiary, is a company that is going places – it's expanding from its Scottish origins to other locations in Europe, China and the US. "The total inward investment was close to €8 million (nearly £7 million) over the last four or five years," says Dr Howard Dryden, the company's founder.

Such investment to scale up the production of the AFM product that was created and tested under LIFE has resulted in a similar upscaling of staff. The company's plant near Edinburgh now employs 17 people. "The AFM product that we manufacture represents about 80-90% of our business…We're doing a huge amount of R&D with the scale up of the production facility and certain technical aspects," says Dr Dryden.

Advanced Filtration Management (AFM), a way of filtering water using recycled glass, is a "disruptive technology" for the water industry, he explains. "Simply changing sand over to AFM would double the performance of most of the drinking water industry, and it would also potentially eliminate about 60-70% of all disease in the developing world."

"Within a year to two years, it [the process industry] will expand – and we'll have to build another factory…We have about 50 000 people using our drinking water in the Republic of Ireland. We have a few hospitals in the UK and the Channel Islands moving onto it. Also, all the water for Guinness in Ireland is filtered by our product."

Technical expertise is very much "in house", given that the company developed the technology under LIFE. Dryden Aqua has a small team at its headquarters in Bonnyrigg of highly qualified engineers and marine biologists on board, who have developed their skills through their work on AFM.

One such person, Christi Ashley-Sing, a graduate in pharmaceutical chemistry from Manchester Metropolitan University, is an analytical/research chemist at the company. He was brought on board through a scheme known as Talent Scotland, which matches highly skilled university-leavers with suitable employers.

The company also benefited from support from the Scottish Government's HydroNation initiative on realising benefits for SMEs in the water sector. Diane Duncan, who heads up this initiative, said: "It's about how we connect them in, how we network them so they are getting the very best of research, equipment, networks from our university sector to accelerate innovation."

But it was the LIFE support initially that got the technology off the ground. "If it wasn't for the LIFE project, I very much doubt we'd be where we are today," acknowledges Dr Dryden.

"We've got nearly 200 other people indirectly employed at our distributors, whose businesses are maybe nearly 50% the products that we are manufacturing – both in the UK and around Europe. We have distributors who are focusing on our products in the UK, Germany, Italy, Spain, France – every country in Europe now has a distribution network, engineers and people that we've trained up."

Learning new ways of managing wastewater

LIFE WaterReuse developed a method for treating and reusing industrial wastewater, using innovative technology that required new knowledge and skills.

"Improving the management of industrial effluents requires innovation in many scientific fields," says factory manager Pedro Muñoz. "The knowledge developed will be multidisciplinary and very specific, so that new jobs will be created. I even dare say that the high demand for professionals with this specialisation will generate a new engineering degree in the management of industrial effluents."

The LIFE project required highly-qualified professionals to design and develop prototypes implementing new technologies and knowledge. To this end it employed a full-time researcher, Inma Castellar, who has become a permanent employee at Spanish beneficiary Destilerías Muñoz Gálvez (DMG). The company is building one new industrial wastewater plant of 70 000 m^2 using two of the technologies developed within the LIFE project (membranes and electrochemical oxidation technologies). This will create further jobs for both unskilled labour and specialist technicians. "LIFE gave us the chance to speed up the industrial development of these technologies," says Mr Muñoz.

With this new plant, the aim is to "recover and reuse most of our wastewater," he adds. "In Murcia, we have water stress and in future we may not have all the water we need. If we can reduce contaminants in wastewater and recycle it, with very little rejection, likely much less than 0.1%, it will have a positive impact on our industrial growth as water is always needed."

"My professional experience prior to the LIFE project was diverse but always oriented to technology and research," says Ms Castellar. During the project, she worked as a technical analyst, "implementing the three technologies developed for the reuse of water with high organic load. This not only involved analytical work, but also a broad knowledge of the functioning of each of the technologies: electrochemical, membranes and photochemistry."

The technology had to be adapted to the different behaviour of each effluent. "It was interesting work. I acquired new technical knowledge and skills, above all, for electrochemical technology which I had never worked with before," says Ms Castellar.

LIFE skills for sustainable desalination plants

REMEMBRANE's innovative technology prolongs the life of a key component of desalination plants, creating highly-skilled jobs to support this fast-growing sector.

Sergio Muñoz Galiano was one of the employees who acquired new skills: "Previously, I was in charge of industrial water treatment plants that used reverse osmosis (RO). For REMEMBRANE I was the main researcher who developed the tests in the pilot plant. I learnt a lot about desalination, RO membranes and reuse procedures. Today, I am operations manager at a seawater desalination plant in Qatar."

"REMEMBRANE allowed us to develop everyone's skills," recalls Pilar Icaran López, the project manager. "New skills were necessary to operate prototypes and to evaluate the quality of treated effluent."

RO membrane technology is used in most of the world's 18 000 desalination plants. Typically, the membranes last for 5-10 years and are then sent to landfill. REMEMBRANE showed that used membranes can be given a new lease of life and then reused in desalination or water sanitation.

Making desalination plants more sustainable encourages water reuse, an EU policy goal. It does this by removing barriers linked to the high cost of reclaiming water. It can also create jobs, as seen by developments at FCC Aqualia, the company that coordinated the REMEMBRANE project.

"We created a position for a researcher, and a student who completed his Masters," says Ms Icaran López. The company expects to create further jobs in commercial development, customer assistance, and membrane recovery as a result of the project.


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Reclaiming water for quality crop production

ReQpro developed a system for treating and reusing wastewater to irrigate high-value crops. This conserves vital water resources, upgrades skills in water management and safeguards farmers' jobs.

"We introduced a third stage to the treatment process at a plant in Italy. The operators have to learn new skills that would not be needed in a conventional wastewater treatment plant," explains project manager, Marco Ligabue of CRPA.

The new stage is based firstly on the removal of suspended solids using multi-layered sand filters, followed by chemical oxidation with hydrogen peroxide combined with low-dose ultraviolet radiation. The end result is water that is clean enough to be used for irrigation. This means it must meet higher standards than water discharged back into rivers.

By providing pollutant-free water for irrigation, the technology helps to maintain jobs in the highly water-dependent agriculture sector.

The process is controlled by a plant manager, with support from one skilled technical worker. "They have to know how the treatments work, the timing to reach limit values for irrigation reuse and the adjustments needed to meet the required standards," explains Mr Ligabue. For instance, certain technical adjustments are needed due to seasonal fluctuations in water quality and quantity.

A third role was created in the laboratory for a technician who tests water samples to ensure water quality is maintained. Technician Lorena Guglielmi was trained to pay attention to the much lower limits of parameters such as heavy metals, surfactants and mineral oil allowed in irrigation water.

The technology is scalable. "As of May 2017 a new wastewater treatment plant for irrigation uses will be constructed in Bologna creating more jobs," says Mr Ligabue.

Offering opportunity through conservation

In Luxembourg a LIFE project has harnessed the manpower of socially-disadvantaged local people in its ongoing efforts to transform the mosaic of wetland habitats in the upper northern region of the Eislek.

"Individuals can acquire a certain autonomy through assisted work in the field of nature," believes Marc Jans, co-ordinator at CNDS Naturaarbechten. This nature protection body, which is part of the Comité National de Défense Sociale, enabled disadvantaged people who have been out of work for a long time to take part in LIFE project activities in the region.

They worked alongside hydrologists and conservationists, receiving training in a range of activities designed to maintain and enhance the value of the landscape, including seed collection, hay transfer, planting rare species and mowing wetlands.

The trainee workers learned how to mow hay manually with brushcutters, how to use chainsaws, plant hedges and trees, install fences and nest boxes and create nature trails. "The task of the team leaders is to teach them how to use the tools in the right and most effective way," explains Mr Jans.

"It has helped long-term unemployed participants to regain a working rhythm," says Mireille Molitor, the project leader. A total of 17 people received the training during the project, with two subsequently taken on by CNDS Naturaarbechten to continue the restoration work.

One of the main outcomes of the project was to show that such practical social work could be linked to biodiversity protection. And the end result is a not only good for the environment but also good for the local economy. The skills that the participants acquire are transferrable to other contexts. "So thanks to the LIFE Eislek project, they have better prospects for finding a first position in the job market," says Marc Jans.

LIFE and blue growth

Jobs and skills in the blue economy

Sustainable growth in fisheries, aquaculture and other maritime sectors will play an important role in achieving EU goals for smart, sustainable and inclusive growth by 2020. These sectors contribute to competitiveness, efficient resource use and job creation, while helping to protect biodiversity and the services that healthy ecosystems provide.

Considering all marine economic activities, the EU's blue economy represents 5.4 million jobs and a gross added value of just under €500 billion per year. In all, 75% of EU external trade is seaborne[6]. This activity is concentrated in coastal areas though even landlocked countries can contribute through marine equipment manufacture. Ports and coastal communities generate most of the innovations that are opening up new opportunities to harness the potential of Europe's oceans, seas and coasts for employment and sustainable economic growth.

The LIFE programme has made valuable contributions to fostering those innovations, and to creating the diverse range of jobs and skills needed for the future growth of the blue economy. Many LIFE Nature projects, for instance, have trained people to manage seashore and offshore Natura 2000 network sites.

LIFE projects that protect marine species can also boost eco-tourism. For example, as well as identifying important areas for bottlenose dolphin, the CETACEOSMADEIRA II project enabled the growth of eco-tourism linked to whale watching in Madeira, and established sustainable limits for this activity. The restoration of coastal salt pans to protect unique habitats and species also safeguards jobs. MANSALT, for example, helped protect traditional salt industry jobs through the sale of sea salt, and encouraged indirect employment by developing eco-tourism around the salt pans.

Close to 300 LIFE projects have enhanced marine and coastal management, and reduced pollution, to facilitate growth in blue tourism. These projects mainly helped deliver high-quality bathing waters and pristine habitats of high recreational value. In line with the circular economy approach, LIFE's enhanced focus on addressing the blight of plastic in our seas (marine litter, discarded fishing gear etc) can create jobs linked to prevention and disposal and indirectly protect jobs in tourism and fisheries.

Small and medium-sized enterprises (SMEs) account for over 90% of aquaculture in the EU, equivalent to around 80 000 jobs[7]. Small businesses and jobs were created by the ECOSMA project. It established criteria enabling organic aquaculture to be included in the EU ecolabel scheme and helped fill a skills gap. It gave training to people working on mussel farms, enabling businesses to replicate sustainable production methods, increase their value and create sustainable employment. The project also showed the potential for diversification by creating new jobs in aquaculture cultivating algae for compounds desirable to the cosmetics industry.

FAROS targeted fishing discards and by-catch, turning costly waste that must be landed into a potential resource for various industries. The project created highly-skilled jobs for biologists, engineers and other technicians; and developed training courses to give fishermen the skills to handle previously unwanted marine biomass. Discards could be a source of additional income for fishermen, and provide new opportunities for employment in the fast-growing blue biotechnology sector.

6. Report on the Blue Growth Strategy Towards more sustainable growth and jobs in the blue economy SWD(2017) 128 final https://ec.europa.eu/maritimeaffairs/sites/maritimeaffairs/files/swd-2017-128_en.pdf

7. http://ec.europa.eu/dgs/maritimeaffairs_fisheries/magazine/en/policy/small-businesses-can-drive-blue-growth-and-put-europe-road-recovery

Training to create jobs in organic aquaculture

ECOSMA developed criteria enabling sustainable marine aquaculture to qualify for ecological certification, and set up a training scheme to promote new skills and create jobs in this sector.

Photo: Thomas Kujawski/oceanBASIS/CRM

> *"New jobs have been created on aqua farms."*
> *Stefan Rehm*

Photo: NEEMO EEIG/Markus Reisenberger

"A main goal of the ECOSMA project was the modification of the EU eco-regulation to make it possible for aquaculture to be certified with a label for eco-friendly production," says Stefan Rehm of German project beneficiary CRM (Coastal Research & Management) in Kiel. CRM has pioneered polyculture aquaculture systems, starting with algae and integrating mussels, and wanted to promote its sustainable products with an ecolabel.

With eco-certification successfully obtained, the project developed procedures so others could convert conventional aquaculture operations into ecologically-sustainable marine systems. "We set up a programme in the last year of the project," explains Dr Rehm, "to train aquaculture workers, and also to get feedback from experts to optimise the system."

Some 40 people in the Schleswig-Holstein region took part in the course, which was accredited by the local university. It has had a multiplier effect as participants have passed on the knowledge and skills acquired. "Some of them belonged to research institutes. There were also people from consultancies, businesses with experience of aquaculture, and people involved with the eco-certification process."

The training programme was designed "to show a pilot system that can increase the capacity for blue growth," says Dr Rehm. "The first part was about understanding the principles of eco-friendly aquaculture. The second part was a practical lecture, looking at the different regulations, looking for the right site, and which organisms could be put together; then we looked at the criteria for mariculture eco-certification and procedures for getting the EU ecolabel."

Project manager Peter Krost continues to give lectures and courses at the universities of Kiel and Lübeck, and the University of Westfjords in Iceland, based on the good practices acquired during the project.

The project's training has stimulated job creation in three ways, reckons Dr Rehm. Firstly, there is significant scope for new research jobs in organic aquaculture, particularly in combining species that have not been farmed before. Secondly, "new jobs have been created on aqua farms. We have a colleague in Denmark who runs a large mussel farm in Jutland who attended the training," says Dr Rehm. "He has picked up a number of ideas to make the farm even more sustainable, and following the principles has increased its value."

The third area is helping the pharmaceutical and cosmetics industries increase their capacity to use marine resources. Dr Rehm cites a recent report predicting that the marine biotechnology sector in the Baltic Sea area would grow in value from US$4.1 billion in 2015 to US$6.4 by 2025[8]. CRM has taken on new staff cultivating algae to obtain extracts and compounds, such as fucoidan. "There are important opportunities for polyculture aquaculture, and we are seeking internationally for companies looking into new ingredients for cosmetics and medicinal purposes."

8. The Future of Marine Biotechnology for Industrial Applications to 2025 – Smithers Rapra http://www.smithersrapra.com/market-reports/biomaterials-industry-market-reports/the-future-of-marine-biotechnology-for-industrial

"Fishermen have learned to be more confident with technology."
Antonio Alonso

Sharing the skills to profit from fishing discards

FAROS trained technicians and fishermen to implement an innovative means of managing fishing discards, turning waste into a versatile resource for blue biorefineries.

"Our objective was to focus on the Landing Obligation in the Common Fisheries Policy that prohibits fishing discards being thrown back into the sea," says Antonio A. Alonso, project manager of FAROS, which like the earlier project BE-FAIR, was based in the fishing capital of Spain, Vigo. The projects identified economically-viable ways of using discards, and methods to minimise the amount of unwanted fish caught. The ongoing LIFE iSEAS project integrates both approaches.

FAROS trained fishermen using best practice manuals. These showed how to handle the catch so that by-catch is kept in the best possible condition for transformation into marketable products. The project equipped fishing boats with an automated system called BEOS, that detects which species are caught by measuring different characteristics. "We organised workshops and demonstrations for ship owners and the fisheries association, to help fishermen operate this equipment," says Prof Alonso.

BEOS data can be used to predict the likelihood of catching the best fish or unwanted discards in particular locations, to organise profitable trips and avoid wasting fuel, and also to plan ahead what to do with by-catch.

The project team continues to test different BEOS prototypes on around 15 boats operating in waters off Galicia and Portugal. Prof Alonso notes that they are getting a lot of cooperation from crews: "Fishermen have learned to be more confident with the technology, and want to be consulted about solutions that ensure the sustainability of fishing."

The LIFE funding has helped create jobs for biologists, engineers, computer modelling experts and other technicians. Luis T. Antelo is among those who have learnt new skills through the project: "I am a chemical engineer, who previously specialised in process control. My present work concerns the marine biorefinery concept, specifically adding value to fisheries discards." The aim of his work is to develop sustainable, flexible and low-cost processing pathways to obtain biocompounds for other industries. "For this work, a solid background in fisheries and discards management, together with bioprocess and biotechnology knowledge, is required."

"It is not easy moving from highly-theoretical process control to the management of marine biomass," he explains. "My involvement with the three LIFE projects enabled me to adapt my expertise on computational tools, to design new bioprocesses and plants for fisheries by-products. Although the transition was not straightforward, once I understood the problem of discards, I realised that I could help using skills I had developed in the process engineering field."

Jobs could be created in the blue biotechnology sector to utilise the properly managed discards. This could supplement fishermen's incomes. By-catch could be a resource for marine biorefineries supplying ingredients for pharmaceuticals or cosmetics, for example, such as the hyaluronic acid in skincare products that is obtained from fish eyeballs.

"The company now has nearly twice as many employees as when we started MANSALT."
Klavdij Godnic

Working to maintain a traditional coastal landscape

A LIFE project in a nature park in Slovenia has created new jobs maintaining saline ecosystems, coastal habitats where salt has traditionally been made. This indirectly supports many more jobs producing and marketing artisanal salt and in a new eco-tourism spa, as well as having huge benefits for biodiversity.

People have been making salt at Sečovlje in Slovenia since Roman times

"This is a very specific habitat: it was man made, it has to be maintained by people. For biodiversity protection you have to invest something," says Andrej Sovinc of MANSALT, a LIFE project that restored and improved a system of sea-defence walls, embankments and internal channels to protect the landscape park, including its salt pans.

Soline, the company that coordinated the project, has a concession from the Slovenian government to manage Sečovlje Landscape Park, which is also part of the Natura 2000 network of protected areas. It also markets the salt under the Piran Salt brand, sales of which contribute one-third of the park's annual running costs to maintain biodiversity.

Highly-prized since antiquity, the uniquely sweet 'petola' salt produced at Sečovlje is today sought after by top chefs, such as Alain Ducasse. Around 20 people are permanently employed at the salt pans, producing up to 3 000 tonnes of salt each year using traditional methods.

The company saw the LIFE project as an opportunity not only to protect these jobs but to create new permanent jobs for the local community by reacquainting people with the skills needed to maintain the complex series of defences around the park. They sought guidance from a few older members of the community - people whose parents and grandparents had worked on the salt pans and who knew how to build infrastructure that would be able to cope with two high tides per day. "We listened to them and we made a team of local people who really had the knowledge how to do this and then we started," says Mr Sovinc. Thanks to the recent LIFE funding, the team of construction workers is now more than 40 strong, "including 20 new people: young people from the local community," he adds.

"The company now has nearly twice as many employees as when we started MANSALT," says Klavdij Godnic, Managing Director of Soline. He points out that the work done by the new construction and maintenance team has led to an increase in the number of protected bird species at Sečovlje: "The stats are excellent: we are increasing the numbers of species and the number of individuals of target species."

The ongoing maintenance work also ensures that artisanal salt-making can continue at the site and it has enabled a private investment in an eco-tourism spa next to the salt pans and bird nesting areas. "You cannot build a spa inside an area which is potentially flooded with mud and water. If you put an investment of more than one and a half million euros inside you have to be sure that the area is protected," says Mr Godnic.

Madeira's sustainable whale-watching industry

Putting whale welfare first is allowing Madeira's whale-watching industry to grow in a sustainable way. LIFE has helped tourism work with nature.

Photo: LIFE07 NAT/P/000646/Madeira Whale Museum

Sustainable whale-watching rules

a. Approach:

- Avoid disturbing marine vertebrates (cetaceans, turtles and seabirds)
- Avoid making noise to disturb or attract marine vertebrates
- Do not chase marine vertebrates trying to avoid the vessel or showing signs of distress
- Do not separate animals from a group, especially the young
- Do not touch, unless freeing from fishing nets or marine litter
- Do not throw objects at marine vertebrates
- Do not enter the water to interact with marine vertebrates unless authorised.

b. Observation:

- Do not get within 50 m of marine mammals
- Do not exceed 12 knots within 300 m of marine mammals, or 8 knots within 100 m
- Avoid sudden changes of speed, direction or course
- If travelling alongside marine mammals, do not exceed their natural speed
- Maximum observation time is 10 minutes.

Whale-watching is an increasingly popular activity for tourists visiting the island of Madeira. However, it needs to be conducted in a sustainable way to avoid harming populations of whales, dolphins and other marine mammals and thereby killing the goose that lays the golden egg.

The LIFE CETACEOS MADEIRA projects (I and II) worked with the whale-watching companies to ensure a sustainable future for the activity. By increasing knowledge about the location and behaviour of whales they were able to establish guidelines for viewing marine mammals (see box) and to show that there was sufficient carrying capacity to safely increase the number of licenced operators from six to 25, creating hundreds of new jobs.

As a result of the projects, in April 2014, the regional government approved legislation setting limits on the number of boats operating from different harbours and on the maximum number of trips per day. These new rules keep pressure on marine mammals within acceptable limits while enabling profitable economic growth in the activity, a double win for tourism and nature conservation and a clear example of business and biodiversity in harmony.

Joel Pereira works for one of licenced whale-watching companies, VMT. "We employ 20 people. Twelve of those are involved in whale-watching activities. As well as the ship's captain and crew, we employ marine guides and a marine biologist," says Mr Pereira. The LIFE project helped train these experts to gather monitoring data that helps the authorities assess the impact of the sightseeing trips.

"We go out twice a day, every day," explains Mr Pereira. He and his colleagues recognise that for tourists as well as whales, the quality of encounters is crucial. "The benefits of following the rules are huge because the cetaceans feel the respect that we have for them and don't swim away," he says.

Island-wide employment

By giving a more accurate picture of whale locations and behaviour, the LIFE projects have also helped to ensure that jobs in the industry are not solely concentrated in Madeira's capital city, Funchal. "New licenses have been given to Machico in the east and Calheta in the west, areas with far fewer boats operating," explains Luis Freitas, who coordinated the CETACEOS MADEIRA II project. "This contributes to the environmental sustainability of the activity and the welfare of cetaceans in Madeira," he concludes.

LIFE and green jobs in cities

LIFE and green jobs in cities

Three out of four Europeans live in cities. By 2050, there will be 36 million new city-dwellers. How can we make sure that urban environments are healthy and liveable, avoid resource scarcity and ensure equitable economic growth?

The challenge is also an opportunity for new businesses and greener ways of working. New jobs and skills in construction, transport, waste management, enterprise and other sectors will be part and parcel of the transition to a circular economy, helping revitalise our housing, infrastructure and other facilities. More efficient use of energy and materials can create new employment.

The LIFE programme has contributed to the spread of green jobs and skills in cities in a host of areas. Projects relating to the circular economy are already a motor for job creation in areas ranging from innovative production processes to waste upcycling to starting real markets for secondary raw materials. Perhaps the greatest impact in terms of developing green jobs and skills has been in waste management. Witness LIFE's role in launching waste repair and reuse centres that have become viable businesses and helped to give hundreds of disadvantaged workers new skills.

The adoption of nature-based solutions in cities is another area where LIFE is taking the lead. Projects are creating teams of workers who are trained to install green infrastructure such as green roofs and sustainable urban drainage systems. These can reduce the risks of flooding or drought, mitigate the 'urban heat island' effect, improve urban biodiversity and create more sustainable communities. The young men and women who learn these new skills also gain qualifications and improve their employment prospects.

Another example of how LIFE has created a positive symbiosis between nature and enterprise is its support for organic city farming. It has helped restore agricultural land around cities by connecting agricultural schools and agronomists to citizens, often with no previous farming experience. These newly-skilled urban farmers have set up in business to supply locally-grown produce to city-dwellers. As well as creating new jobs, such projects boost cities' green infrastructure and resilience to climate change.

LIFE projects in construction have forged useful alliances with universities and technical colleges in order to train architects, builders and others in the trade to work with sustainable materials or to improve energy efficiency.

Linked to this sector, an increasing number of LIFE projects are demonstrating good answers to the question of how to better manage construction and demolition waste, a priority area in the EU's Circular Economy Action Plan. One way is by showing the benefits of dismantling buildings rather than demolishing them. This will create a demand for new green jobs, both skilled and unskilled.

LIFE's impact in cities extends to the financial sector. A project in Greece helped Piraeus Bank set up a Green Banking division. Staff received training in topics such as renewable energy, organic farming and green infrastructure, enabling them to evaluate business plans and develop green products and services.

Finally, funding for sustainable transport projects has enabled mechanics and engineers to learn the skills needed to keep non-polluting electric vehicles on the road, with obvious benefits for air quality too.

Upskilling for electric vehicles in Malta

Engaging in a LIFE project, DemoEV, has "opened doors" for employees of Malta's leading renewable energy company.

Photo: Paul Tickle Photography

Two employees at Solar Solutions in Malta have learned vital new skills for the future job market thanks to LIFE. They received training in electromobility as part of a project designed to boost the use of electric vehicles (EVs) in the country.

David Zammit, the company's financial and major projects director and an employee went to Germany for training at RWE (now Innogy), the power generation and energy trading company, on different aspects on EV technology – such as the dismantling and reassembling of components, trouble-shooting and the use of specialised tools. Solar Solutions is Innogy's representative for electromobility in Malta.

"The goal of the training was to make us as independent as possible. In my opinion this was achieved," says Mr Zammit.

Solar Solutions makes use of the new skills a couple of times a month and has passed on the freshly-acquired know-how to another employee. Such knowledge is beneficial for this growing area of the company's business. "It gave us a better understanding of the connectivity between car and charging point, and this eventually gave us the knowledge to import, sell and eventually repair other products," says Mr Zammit.

Not only are he and his wife now driving EVs, so are his colleagues at Solar Solutions. "They are very cheap to run, especially if your electricity comes from photovoltaics. This project has completely changed the way I live my life – for the better."

Main picture shows European Commissioner for Environment, Maritime Affairs and Fisheries Karmenu Vella visiting the LIFE DemoEV project.

Photo: Peter Paul Barbara

Developing landscapes and changing lives in London

Helping the long-term unemployed back into the workplace was one of the main outcomes of the London green infrastructure project, LIFE Housing Landscapes.

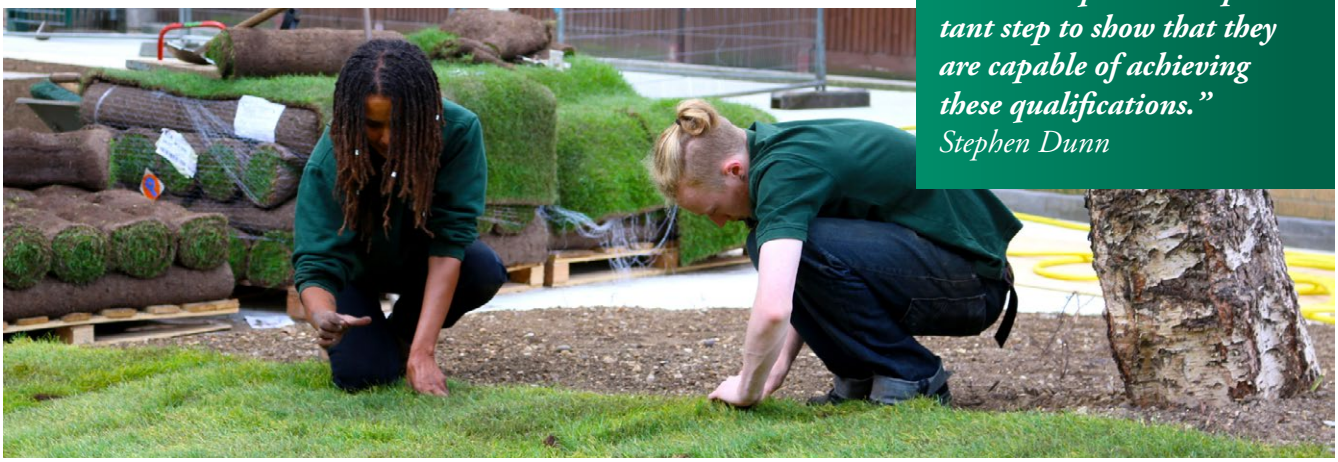


Photo: Groundwork London

> *"It can be quite an important step to show that they are capable of achieving these qualifications."*
> *Stephen Dunn*

The LIFE Housing Landscapes project enabled an initiative called Green Teams to extend the scope of the skills that team members learn. This helps to improve their future job prospects. Green Teams is run by the environmental regeneration charity, Groundwork London. LIFE funding allowed many of the short-term, paid contracts offered by the initiative to be increased from six months to nine, enabling the trainees to acquire more qualifications. "They had to learn quite a lot of landscaping skills, as well as general grounds maintenance. So it was quite an intensive time for the guys," says Stephen Dunn, the Green Team Programme Manager.

For many of those who join a Green Team, these vocational qualifications (City and Guilds) represent their first certificates, or first since leaving school. Assessment is continual and on site. "It can be quite an important step to show that they are capable of achieving these qualifications," he says.

Building employability

The Green Teams were involved in the LIFE Housing Landscapes project to retrofit green infrastructure in social housing areas as climate change adaptation measures. They received on-the-job training in installing Sustainable Urban Drainage Systems, drought-resilient planted areas and other soft landscaping elements. But growing the confidence of team members was just as important, says Hannah Baker, the project leader. "It's about helping them with personal skills, interacting with other people, that kind of thing, as well as the physical skills that will help them get a job."

The initiative has a high success rate. Of the 22 Green Team members temporarily employed through the LIFE project, 14 are now in full-time employment or education. "Groundwork has a large employment services team that helped them find roles", she adds.

Stephen Dunn has built up good contacts with local businesses during his time associated with the initiative. He says it's important to develop the skills that employers are looking for. "It's really hard to train someone up to be a fully-qualified gardener. It can take years to build up the proper knowledge. But we can give people the basic training with the machinery and the basic techniques, and then expect the employers to invest in the staff when they take them on as well."

The project was also a good opportunity to raise the trainees' awareness of green issues. "We were talking to them about why they were putting these measures in and how they help the local urban environment, alleviating flooding and having local cooling effects. We had some people who were really interested in taking it on and they went into gardening," says Mr Dunn.

The LIFE funding has also helped the organisation to develop its capacity for green landscaping and gardening, acquiring supervisors and trainers in the area. "We have been able to maintain that type of landscaping since the LIFE project." adds Mr Dunn. The seed that LIFE planted continues to bear fruit in terms of job creation without needing further funding support.

The impact of the project could spread in other ways too. Hammersmith and Fulham Council, a project partner, is eager to explore carrying out a similar programme in other estates in the borough. Furthermore, Groundwork London is encouraging other housing providers to run similar initiatives and has produced an implementation guide for carrying this out (available at www.urbanclimateproofing.london). This method can be replicated across the EU, creating many more jobs within our cities, whilst making them greener and more resilient to climate change.

Photo: Groundwork London

Wayne Essien, former Green Team member, who now has a seasonal nine-months-a-year contract with Groundwork London:

"I wanted to learn more about the landscaping side of things, after being trained up and getting my certificates. I was just a basic gardener and I didn't know how to use the tools at all, so I had to be trained up for that. And it just made gardening more attractive.

It made me more environmentally conscious; there was a lot more that I needed to learn. I didn't realise that there were different levels of gardening as well. We maintain residents' gardens, especially those who are vulnerable and can't move around. They are often older and might not have family members to help them. We maintain their gardens between March and October.

I run my own cleaning and gardening services as well, so I adapt what I learn to what I do with these services as well.

I wanted to learn more about the landscaping side of horticulture. So, to learn how to lay turf, prepare soil and plant trees and shrubs at the same time as learning how to make rain gardens and swales was perfect for me. I didn't realise the importance of soil levels and that you could stop an area from flooding by making the rainwater go into the rain garden instead of the drains.

It made me more environmentally aware and I found there was a lot more I needed to learn. The skills I gained by learning to build and maintain the green infrastructure on the LIFE project are skills I still use today in my work. I will build on these skills the rest of my life."

Training the building trade to be greener

A LIFE project in Austria taught architects, builders and planners the skills necessary for sustainable building.

Photo: LIFE00 ENV/A/000243/NEEMO EEIG/Monique Braem

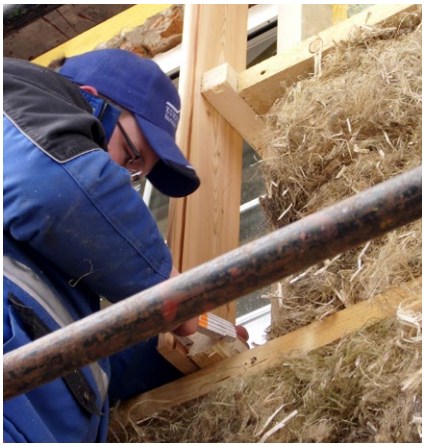


Photo: GrAT 2013

Photo: NEEMO EEIG/Edward Thorpe

The construction and demolition of buildings is a source of pollution and unnecessary waste. Many buildings could be more energy and carbon efficient. In order to achieve this, architects, builders, planners and others in the trade need to be upskilled in the use of renewable resources and natural materials, such as straw bales.

RENEW BUILDING was a LIFE project that set out to demonstrate that this can be done. "It was not our goal to have a single sustainable housing concept," says Stefan Prokupek from the Technical University of Vienna (TUW), the project coordinator. "The idea was to give key construction sector stakeholders the tools and knowledge necessary to include sustainable materials and design features in their everyday commercial projects."

Training was both theoretical and practical. The theoretical part included an e-learning course, comprised of five modules (40-50 hours), as well as lectures for students at TUW – the first time sustainability concepts had been integrated into its architecture or civil engineering courses.

More than 100 bricklayers, carpenters, architects and others took part in practical courses in 'ecological building and renovation' in Sarleinsbach and at the S-House in Böheimkirchen, a multi award-winning demonstration building constructed with the help of an earlier LIFE project by the Centre for Acceptable Technology (GrAT).

The courses enabled participants to analyse material properties, construction requirements, costs, ecological impact and other factors. In the case of architects for instance, this would enable them to justify greener solutions to clients. The technical training covered use of sustainable materials in the construction of walls, floors, roofs, ceilings, foundations, surfaces, windows and doors.

One construction company, Vogler, has sent workers to four training sessions because it has seen the potential economic benefits of offering sustainable building solutions to clients as part of standard commercial contracts.

Birgit Schwarzenberger, traineee architect:

"It's really cool using clay and straw and reed; I think there's so much concrete and polystyrene in the world, and these are materials that are sustainable."

Peter Csala, was a 19-year-old apprentice bricklayer with Vogler when he took part in the training, learning to use lime plaster: "What I learned in the first course I have already used on three building sites," he says. "Only the people who have been on the course know about these techniques."

Wider industry buy-in is needed to persuade universities and institutes to provide more training of this kind, as well as training for energy auditors to assess and improve the efficiency of buildings and construction processes. Peter Csala's experience proves that educating the young generation can contribute to making the use of sustainable materials and techniques commonplace, creating many jobs in the process.

How to deconstruct a building

A LIFE project to make the gypsum industry more circular has opened a pathway to a new type of skilled job in the waste management sector: building deconstruction auditor.

Gypsum is an abundant mineral that is used to make plaster and plasterboard, materials widely used in construction. The gypsum industry generates 1% of all construction and demolition waste. A LIFE project called GtoG set out to reduce this figure by showing that it is possible to dismantle plasterboard at demolition sites, reprocess the waste and then use up to 30% recycled gypsum to make new plasterboard.

Dismantling buildings rather than demolishing them will create a demand for new green jobs and new skills. "You need to separate, you need time and you need trained people," explains Christine Marlet, Secretary General, Eurogypsum, the project coordinator. "There are no consolidated figures, but you would need more people than for demolition, you would need building auditors as well; expert jobs and unskilled jobs – everything," she says.

As well as demonstrating how to dismantle different types of building, the GtoG project produced handbooks on 'best practices in audit prior to deconstruction of buildings' and 'best practices in deconstruction techniques'.

Ms Marlet believes that incentives to make deconstruction and sorting mandatory are key to the creation of a truly circular gypsum industry, where building deconstruction auditors are commonplace. In her view, this needs to be accompanied by 'design for deconstruction': "raising architects' awareness is essential if we want to increase the technical feasibility of deconstruction."

The LIFE GtoG project has created a roadmap to this sustainable future, thus helping make these jobs of tomorrow jobs of today.

How to carry out a building deconstruction audit

- *Obtain site plans and assessments of asbestos, lead and other hazardous materials*
- *Make a visual reconnaissance of the site; where possible also drill or open materials to confirm their contents*
- *List the different structures and different materials that make up the structures*
- *Calculate the quantity of each structure and the quantity of each material*
- *Indentify local outlets for each type of material*
- *Calculate the recovery and elimination rates for the materials*
- *The final audit should include information about the legal framework for waste management.*

The social enterprise turning trash into treasure

PRISCA's model for new reuse centres can promote the circular economy, reduce waste sent to landfill and create jobs sorting, repairing and selling 'unwanted' goods.

"It is really great to be in this Europe, because without it this type of knowledge exchange would not be possible."
Gianluca Saggin

The PRISCA project created permanent jobs at two reuse centres that it established in Italy, in collaboration with social cooperatives. Sorting bulky waste is labour intensive, says project manager Marco Frey, from the Scuola Superiore Sant'Anna. "The manual tasks require different levels of expertise, allowing everyone from professionals to disadvantaged people to get involved. While some workers repair things (e.g. furniture, bicycles) or test appliances, others help in the logistics of running the reuse centre." Professor Frey also notes the importance of workers involved in sales and marketing, who play a key role in raising awareness about sustainable consumption and its role in the circular economy.

The reuse sector is fertile ground for social cooperatives aiming to bring disadvantaged people back into the workforce.

At the HOBBIT social cooperative's reuse centre in San Benedetto del Tronto, for instance, PRISCA created positions for disabled people and workers with psychiatric problems. Training the new employees at the two reuse centres focused on a range of skills linked to repair. The project also helped introduce standardised procedures to improve working conditions, which could be adopted throughout the sector.

Thanks to PRISCA, Gianluca Saggin is now managing the laboratory dealing with the repair of electrical goods at one of the two reuse centres, that of Insieme Cooperative Society in Vicenza. Along with the rest of the repair team he was taught by a local expert. "The first thing we learned was to see if the goods still work. I was amazed by the enormous amounts of perfectly good electronic equipment people just throw away." If goods are not working they are sent to the repair laboratory.

"To decide which goods can be repaired I was taught how to do a cost-benefit analysis, comparing repair costs to sales prices supplied by second-hand shops, which is something I enjoy doing," explains Mr Saggin. If repair costs are unfavourable, items are added to the remaining e-waste. The functioning and repaired items are cleaned "so they look and function as new", and sent to second hand shops for resale.

"I really enjoyed learning new skills, the responsibility, and I am now able to repair many electronic products," says Mr Saggin proudly. "I was given the chance through the PRISCA project to travel in Europe, to Brussels and Strasbourg to visit other reuse centres and social cooperatives. This is a learning experience I would not otherwise have had. It is really great to be in this Europe, because without it this type of knowledge exchange would not be possible."

Photo: Ayuntamiento de Zaragoza

Eco-farming in the city

A LIFE project in Zaragoza gave training and technical assistance to entrepreneurs wanting to develop businesses in local, non-intensive farming. Carmen Magdalena is one of those entrepreneurs. With two partners, she now runs the company Ortal y Tal.

"Ortal y Tal is an associated work cooperative that is born of common dreams and the conviction that we can contribute to feeding our society," says Carmen. "We grow healthy and nutritious foods and we move towards food sovereignty through agro-ecological production and marketing in short channels and direct sales."

The three partners behind Ortal y Tal learned vital skills to achieve their goal through training sessions organised by HUERTAS LIFE KMO, a project that set out to restore agricultural space around Zaragoza and train up eco-farmers to supply the city with locally-grown fruit and vegetables. This contributes to halting environmental degradation, restoring soil fertility, regenerating the natural environmental system and protecting local biodiversity as well.

"I learned all about ecological cultivation," says Carmen. "The importance of soil preparation and land management to have a living soil; organic fertilisation; how to combat pests naturally using nature as an ally; how to plan your crops and harvest; and what to do post-harvest."

Now she and her partners are putting everything they have learned about co-operativism, teamwork and ecology to the test. Ortal y Tal is one of 12 businesses that has been set up as a result of the LIFE project. "We have several plots, about 4 hectares in total, with greenhouses, on the road to Jarandín. We are mainly producing local varieties of vegetables. We also grow medicinal and aromatic plants that are good for biodiversity to create a natural balance," explains Carmen. "We have a small tractor, but soon we plan to use animal traction."

The company delivers the vegetables – and other products such as fruit, organic honey, free range eggs and olive oil - to six 'green points' in Zaragoza for collection by customers. The LIFE project has helped these businesses get off the ground, not only by offering advice, but also through practical measures, such as a stall at the local agro-ecological market in Zaragoza's main square and partnerships with schools, hotels and restaurants to use the locally-grown produce in their meals.

One in seven working age adults in Zaragoza is unemployed. HUERTAS LIFE KMO has shown the potential to create jobs in the city on eco-farms that improve ecosystem services, enhancing nature, greening urban areas and cutting food miles (and associated emissions).

Prior to Ortal y Tal, Carmen spent 15 years in retail. She has also worked as a photographer and a goatherder. She is enthusiastic about her new career and the support of the LIFE project. "It has been a very positive experience, including bumps, trips and all the difficulties that lead to a change of life, vision and work," she says.

Greening the banking sector

A LIFE project in Greece helped Piraeus Bank to create new jobs in 'green banking' and support green investments.

"We started by hiring four people to improve the bank's internal environmental performance and develop new green banking products," says Dimitrios Dimopoulos, director of Piraeus Bank's environment unit.

This number grew substantially with the establishment of an environment unit and a green banking division, whose role was to help the bank's existing divisions fund green investments. It also worked with potential clients to help them understand the true costs and benefits of investments.

Those working in the environment unit and green banking division need a good background in general environmental issues. "Things like sustainability, climate change and biodiversity," explains Mr Dimopoulos. Some staff have degrees in environmental studies; those without an environmental background learn on the job. A number of agriculture experts joined the green banking division after Piraeus Bank acquired part of Greece's Agricultural Bank in 2012.

"Despite the economic crisis this country has been going through for the past six or seven years, there haven't been any cutbacks in our environment unit or in green banking. Instead these have grown," points out Mr Dimopoulos.

"Green banking creates new markets by providing the money necessary for their development," says Piraeus Bank's general manager Vrassidas Zavras. "This in turn forces companies to respond and develop new, more sustainable, products and new jobs."

Photo: LIFE06 ENV/GR/000375

"Green banking creates new markets by providing the money necessary for their development." *Vrassidas Zavras*

Maria Iliou is director of Piraeus Bank's green banking & development programmes division

"I have been working for Piraeus Bank since 1994. In 2009 I joined the green banking division. My goal was to correlate the banking sector with the new 'green opportunities'. At first I didn't know much about green banking, but with training and reading a new world opened up for me.

As part of my job, I've acquired skills in evaluating business plans for projects related to the many sectors for which we are developing green products and services, from clean energy to climate change to green transportation, among others. Since 2009, I have been promoted twice and recently I also took on the new position of environmental and social management officer of Piraeus Bank."


LIFE
working
for our
greener future

LIFE and our greener future

As the circular economy becomes a reality there will be fundamental changes to our economy. To employment also, as the shift to a green economy requires new skills.

EU environmental policies are helping to shape this greener future. The Circular Economy Action Plan is creating new business opportunities and stimulating more sustainability in key sectors. Companies are already developing new, sustainable business models, expanding their markets and using resources in more innovative and efficient ways.

All of this means more green jobs and the need for staff with the right skills to fill them. Training workers for the new types of employment in the green economy and for 'greening' existing jobs can be done in-house. Universities, colleges, institutes and vocational training centres will also play an important role in bridging any skills gaps.

The LIFE programme has already supported hundreds of circular economy-related projects. Many developed new solutions and technologies that have been scaled up by attracting other investors, creating new green businesses and jobs.

Increasing the repair and reuse of waste, and creating a market for these 'secondary products', is one of LIFE's strong suits, as already seen in the story of PRISCA and its waste repair centres in Italy (see page 38). The programme has helped create many jobs and improved workers' skills in waste management and recycling.

One such project, which improved recycling of end-of-life (EOL) vehicles in the Netherlands, built up workers' skills to use innovative technology. It enabled EU recycling targets to be met while also creating a market for secondary raw materials and producing extra revenue.

A project in Spain and Portugal focused on dismantling and recycling end-of-life ships in a green way. This produces valuable secondary raw materials but needs highly skilled workers to decontaminate and dismantle the vessels. Already profitable, the sector is set to grow as legislation on EOL vessels is adopted by the end of 2018. The new rules will mean more green jobs here in future, demonstrating how legislation can also be a driver of job creation.

Innovative green projects are another strength of LIFE. Many have attracted further investments, developing green businesses that have gone on to grow in Europe and around the world. LIFE has been a catalyst for investments in renewable energy in Sweden, where one project developed a new way of producing eco-friendly, cost-efficient solar cells. This technology is now being scaled up after attracting new investment, and more skilled staff are being hired for a number of new posts.

A project in the Netherlands produced a new, biodegradable and compostable packaging material from industrial starch, and created a green business stretching from Europe to the USA and the Far East. The packaging was so innovative that the manufacturer had to develop close links with universities in the Netherlands in order to ensure staff had the necessary green skills.

Powering the future

The Dyemond Solar project used LIFE funding as a catalyst for investment in its innovative solar cell technology, creating a brand new green business.

> ***"We built the first pilot-scale production plant with LIFE funding, which also enabled us to bring in private funding to match it."***
> *Giovanni Fili*

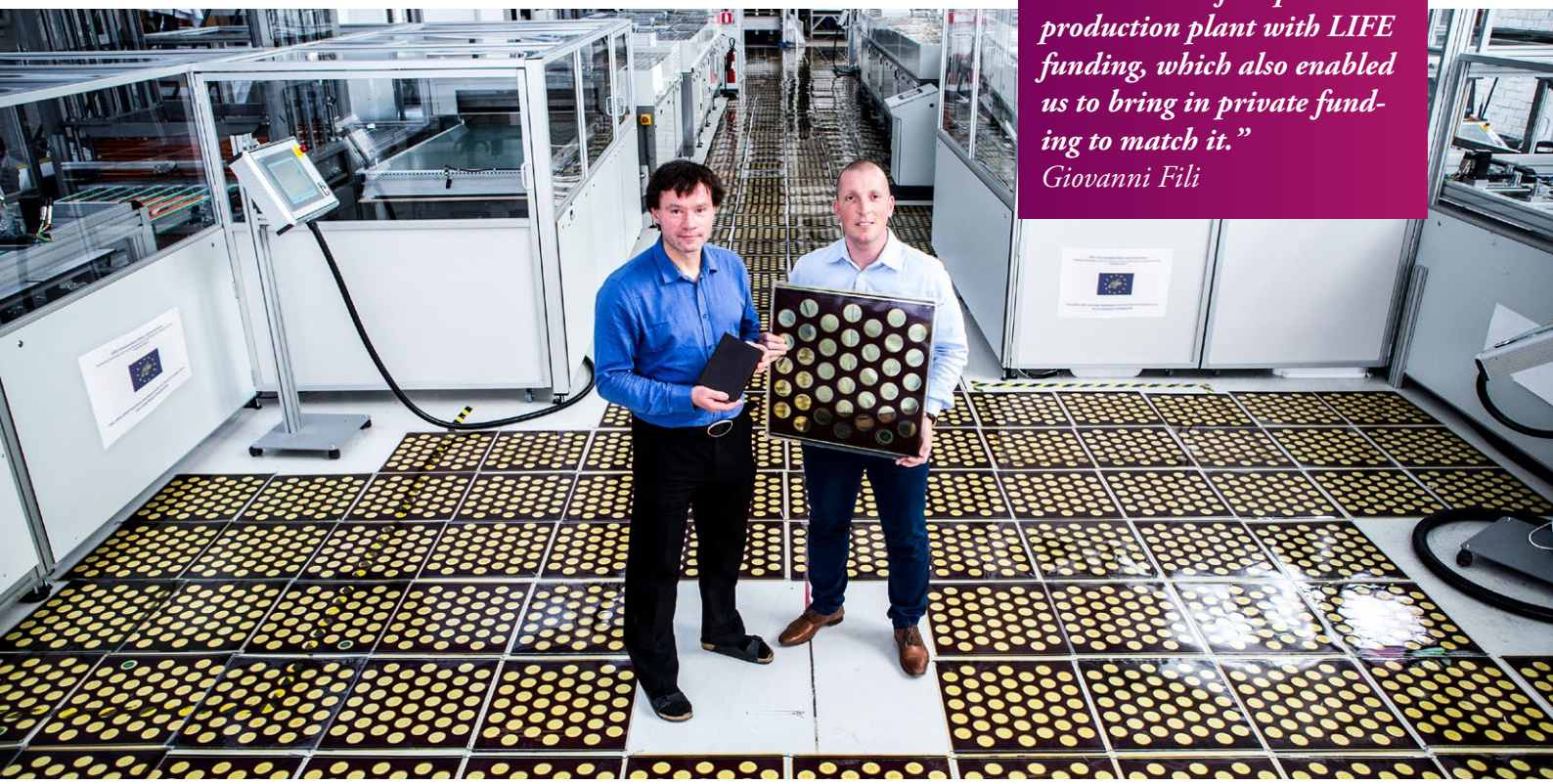


Photo: Lars Lyrefelt

"We developed a new kind of solar cell," explains Giovanni Fili, CEO of the Swedish start-up and solar technology company EXEGER. "We use nanomaterials printed layer by layer on top of each other, with no toxic materials or emissions. It's very cost effective and environmentally friendly."

The ground-breaking cells are sensitive to artificial light which means they can be used indoors. Among other benefits, this could make phone chargers a thing of the past. The thin cells can be produced with different colours, shapes and patterns. "These characteristics allow us to seamlessly integrate them into basically any surface, enabling it to produce power," Mr Fili says. For instance, they could be wrapped around the body of a car to power it.

"We built the first pilot-scale production plant with LIFE funding, which also enabled us to bring in private funding to match it." EXEGER secured further financing - predominantly from industrial investors - to scale up to commercial production, creating more than 50 jobs to date. "It's a mix of mainly production people [machine operators], engineers and researchers, with some business administration and finance staff," the CEO notes.

Some of these are highly skilled roles. Camilla Niva, head of project management and recruitment, explains: "The operators run the machines that produce the solar cells; they follow the standard operating procedures developed by our researchers in collaboration with the engineers. We build or rebuild most of the production machines ourselves, so we need engineers to do that and perform maintenance work."

All EXEGER employees are trained in the basics of solar cells and their role in an energy system. "The researchers, who have science backgrounds, get more detailed training on the specifics of our technology," Ms Niva says. "Our solar cells are unique. They aren't like anything else the researchers will have worked with before, even if they have a background in solar cell technology."

EXEGER is raising its annual production of tablet-sized solar cells from 10 million to 15 million, after attracting further investment from Finnish clean energy company Fortum. "In total, we've raised something like 400 million [Swedish] crowns so far," says Mr Fili. The expansion will create further new jobs as the company hires additional operators, researchers and engineers.

"The next phase will be to build a huge new factory, possibly in Sweden, before 2020," he adds, which could create another 300 jobs. "We're planning for this already because we think we're going to sell enough solar cells to need it. We'll use a mix of public and private funding."

Many of the new positions will likely be machine operators, but a number of researchers and engineers will be needed. "We are constantly looking for the next product line or improvement," Ms Niva says, "That's why we hire so many researchers."

Growing a sustainable packaging business

The story of PaperFoam shows how LIFE can help 'green' an industrial sector and bridge a skills gap through working with local universities.

"LIFE funding played an important role in the early development of PaperFoam," says Marc Geerts, CEO of the company which is based in the Netherlands. PaperFoam is a recyclable, biodegradable and compostable packaging material made from industrial starch (from potatoes or tapioca), natural fibres, water and "our secret premix", explains Mr Geerts.

"Our LIFE project helped us to scale-up our pilot processes, explore new materials and prove the environmental credentials and market-readiness of PaperFoam packaging," he says.

In the 15 years since, PaperFoam has since grown to encompass four manufacturing locations, three outside Europe – in the US, Malaysia and China – and one in the Dutch town of Barneveld, which also serves as the company's headquarters.

"We now have around 60 people at the Barneveld site," says Mr Geerts. "That's partly workers in the factory producing the PaperFoam and partly high-skilled staff such as industrial designers, researchers, marketing and salespeople. We also have engineers working on the machines and electrotechnics."

Much of the research team's work is dedicated to developing the packaging material (see sidebar). The CEO explains: "We have been working on the humidity resistance; we are working on strength; we are working on the ability to resist radiation, that's necessary in the food branch and the medical branch as well; we are working on lidding, so we can offer closed packaging, and so on."

On the sales side, where the company has expanded in recent years too with staff now in Berlin, the USA and Malaysia, employees also "need a lot of technical skills", explains Mr Geerts. "They first work in the factory to know what the material is about, then they look around at the design department to know about designing; and then they start with the first sales cycle." This knowledge gives them a better understanding of customers' packaging requirements and how PaperFoam might meet those needs.

The use of renewable ingredients, low water consumption in the production process and the light weight of the packaging means that PaperFoam has a very low carbon footprint.

Today, it can be seen protecting many different types of products. "We started with electronics, phones and ear plugs; then we made a lot of CD cases; and during the last eight or nine years we have been diversifying in many ways: medical packaging, cosmetics, egg boxes etc," Mr Geerts points out.

Marlies Lorist
is a researcher at PaperFoam

"My long-term research is on improving the characteristics of PaperFoam. At the moment I'm focusing on foam stability. Previously I worked in the food industry. For my first six months at PaperFoam I was one of seven trainees. We worked in all departments to gain a very broad knowledge about the company. We did group projects covering concept to packaging design, sales and production - the whole cycle. It was a very valuable experience."

Jeroen Zaal
is a packaging design engineer at PaperFoam

"I studied industrial design at Windesheim University. My job is to design different ways of using PaperFoam packaging. I'm also responsible for engineering the moulds that produce the PaperFoam parts and making sure they have the highest yield possible. A big part of my job is trying to make consumers aware that this packaging is made from an environmentally-friendly material, and that the widely used plastic packaging materials are not necessary."

Bridging the skills gap

PaperFoam works with universities in the Netherlands on a number of educational projects to build up skills in working with the starch-based material, since it can be difficult to find industrial designers with significant experience of this.

For instance, it has carried out half-year long product development projects using PaperFoam with design students at Windesheim University of Applied Sciences in Zwolle. "60 students each year – we teach them about the material and then they ask questions, do market research and make a business plan," says Mr Geerts. These links have led to skilled jobs at the company for some of the students: "We have six workers now who originally came from that technical school." (see sidebar).

"We are also working with the University of Twente in Enschede, resourcing chemical engineers and bio-chemical engineers," the CEO continues. In 2016 PaperFoam launched an internship programme for recent graduates from several Dutch universities which led to some joining the company in sales, research and production.

As well as creating highly-skilled jobs for science graduates, the CEO hopes the company's work with students will lead to some that join other companies "thinking of PaperFoam when they need some packaging".

Mr Geerts is optimistic that PaperFoam can continue to deliver green jobs and growth, with hopes for expansion into southern and eastern Europe: "It starts with sales: we are working on that at the moment. Then the next step would be to have production local to the sales."

"In my new role, I learned how to identify the matrix of shredder waste and work with different analytical techniques."
Karin Tito-Vader

Getting more out of scrap vehicles

A project in the Netherlands to improve processing of 'car fluff' has helped the country achieve its vehicle recycling targets. It has also led to the creation of a skilled and specialised workforce.

"Staff from all disciplines worked on optimising our plant," says Marcel van der Veer, Quality and Environment Manager at ARN Recycling's facility in Thiel. Opened in 2011, the plant handles all car fluff generated in the Netherlands.

Car fluff is more properly called automotive shredder residue (ASR). It is the material left over when scrap vehicles are dismantled and typically accounts for around 20% of the weight of an end-of-life vehicle (ELV). Dealing effectively with ASR was crucial for the Netherlands to meet the target of reusing and recycling 95% of ELVs (by weight), in line with the ELV Directive and the objectives of the EU Circular Economy Action Plan.

The Thiel plant uses post-shredder technology (PST) to achieve this ambitious goal, separating materials into plastics and fibre that are sold for a variety of end-uses (e.g. extruder granules). The LIFE PST project helped optimise procedures and upskill employees.

"We bought several instruments to determine the quality of our PST process," says Mr van der Veer. "You can carry out a wide spectrum of analyses on them." Staff had to learn how to use these instruments and adapt them to improve the process.

Karin Tito-Vader, a chemical analyst at ARN Recycling, was one of the staff who picked up new green skills. "Before this job, I worked as a chemical analyst at Wageningen University determining soil and crops. In my new role, I learned how to identify the matrix of shredder waste and work with different analytical techniques, such as X-ray fluorescence, gas chromatography-mass spectrometry and Fourier transform infrared spectroscopy, to establish the quality of the shredder material and end-fractions. I have also learned how to control certain components in the PST process."

The improvements in sorting, treatment and material recovery resulting from the LIFE project and the new skills learned helped the Thiel plant achieve 87.7% material recycling and 9.3% energy recovery, taking reuse and recycling (by weight) of ELVs in the Netherlands to 97%.

With the project, ARN Recycling has also created more high-value recycled materials and developed new markets to use them as 'secondary raw materials', which is also in line with the Circular Economy Action Plan.

New skills for old ships

The LIFE Recyship project showed how clean, green recycling of end-of-life ships could create skilled new jobs and help revive declining shipyards.

"We expect to see the activities in the boat dismantling sector increase by the end of 2017 and throughout 2018."
Miguel Ángel García Molina

Mafalda Mota is an environmental engineer at Navalria Drydocks in Aveiro, a small city 60 km south of Porto. Her job involves drawing up procedures for dismantling ships that have reached the end of their working life.

"The first stage is to decontaminate the ship; removing fuel, water and other waste liquids and venting any dangerous gases. Next, I inspect the site to calculate the re-sale value of working equipment and the scrap value of metal. Finally, I prepare a plan of action for dismantling," she explains.

Her workplace is one of only two sites listed in the European registry of boat dismantling plants. The EU Ship Recycling Regulation (1257/2013) foresees that, by the end of 2018, all large commercial seagoing vessels flying the flag of an EU Member State will have to be recycled in ship recycling facilities included in this registry, ensuring the work is done safely and without environmental harm[9]. This new Regulation is expected to stimulate a ship dismantling industry that follows best practices, creating jobs through the 'green restructuring' of dockyards that currently build or repair ships. This shows how EU legislation can be a driver for the creation of green jobs. Around 150 European-flagged vessels are put out of use every year, which gives an indication of the potential scale of this industry.

Dismantling a waste ship typically requires a team of 10-12. This includes people whose job is to separate onboard waste, a water treatment system operator, the workers who cut the ship apart, as well as forklift and other drivers.

João Caçola is one of the men who does the cutting work. He takes a breaking from dismantling the Vandoma - a decommissioned 35 m-long tug boat that was launched in 1944 - to have a chat. "I have been repairing ships for more than 30 years. Dismantling is more dangerous; you must be careful." That's where the dismantling plan comes in. "I have to think which piece to cut first, which second, which third and so on," explains Ms Mota.

The Navalria Drydocks began dismantling ships as part of Recyship, a project supported by the EU's LIFE programme. Miguel Ángel García Molina, managing director of Reciclauto Navarra, the company that coordinated the project, predicts a bright future: "We expect to see the activities in the boat dismantling sector increase by the end of 2017 and throughout 2018." The techniques developed by Recyship are now being replicated at other dockyards in Spain, France and Portugal.

Mr Caçola is proud to be a pioneer of ship dismantling in the EU: "With regulation, it could be a job path like any other."

9. http://ec.europa.eu/environment/waste/ships/

LIFE and voluntary work

LIFE and voluntary work

Volunteers play a crucial role in the success of the LIFE programme. LIFE Nature and Biodiversity projects in particular have benefited from the ability of nature conservation NGOs to leverage their networks of volunteers. This cuts the costs of conservation work, makes local communities feel involved and helps ensure projects are sustainable in the long run.

LIFE projects have traditionally involved volunteers in everyday conservation and restoration work, such as monitoring, tracking, wardening, ground clearance and planting.

In recent years, forward-thinking projects have begun to mobilise their volunteers in innovative ways, such as advocacy work, building expert and community networks and high-tech monitoring of project results.

The experience of volunteering can help people learn new skills, many of which are not only useful in the workplace today, they are applicable to the greener economy of the future. In this section, we hear from two people who have participated as volunteers in recent LIFE projects. We also hear from a company that has encouraged its employees to volunteer with a LIFE bear conservation project. Corporate volunteering is a growing trend with benefits for companies, employees, conservationists and ultimately, nature and biodiversity.

The main goal of LIFE Nature & Biodiversity projects is to support the conservation of endangered habitats and species and raise awareness of the importance of conservation and the Natura 2000 network. However, as Daniel Calleja Crespo from DG Environment notes in his interview (see pages 5-6), "LIFE's contribution to local employment in rural or disadvantaged areas should not be overlooked."

Jean-Claude Juncker:
"The European Solidarity Corps will create opportunities for young people willing to make a meaningful contribution to society and help show solidarity – something the world and our European Union needs more of"

The European Solidarity Corps

Tackling youth unemployment is a top priority for the EU. All Member States want to boost employment and the Commission is supporting their efforts through policies and actions designed to achieve this common goal. Last year, President Juncker announced his intention to step up efforts in support of youth through the creation of a European Solidarity Corps (ESC) as part of a broader policy agenda geared towards the inclusion of young people in society, the Bratislava Roadmap. The ESC is a volunteers-based initiative open to young people aged 18 to 30 who wish to make a hands-on contribution to society in areas such as disaster relief, social integration, environmental protection and poverty reduction. Volunteers will gain important life skills and practical skills that can help them find work.

LIFE is holding a call for proposals for preparatory projects for the ESC in the areas of environmental protection, nature conservation and restoration of natural areas and ecosystems, mainly the Natura 2000 network. With a budget of €3.3 million, this is jointly financed by LIFE and the European Agricultural Fund for Rural Development (EARDF).

The LIFE programme is also partnering with ERASMUS+ to offer environment cross-border volunteering opportunities to young Europeans in 2017.

New experiences, teamwork and personal fulfillment

Photo: João Reis Silva

Joana Batista is leader of the Barcouço Youth Group in Portugal. She talks about volunteering with BRIGHT, a LIFE Nature project that is removing invasive alien plant species to conserve biodiversity in the Buçaco National Forest.

"I joined a local scout group when I was a child, that's the first time I remember doing any volunteering. About five years ago I began participating in voluntary activities at the Buçaco National Forest, promoted by the youth association, G.J.B. Youth Group of Barcouço. This was part of the volunteering programme of the BRIGHT project.

I have participated in actions to control invasive alien species, in planting actions, in seed collection workshops, in the preparation of infusions and forest cleaning actions.

I wanted to help this LIFE project because the forest needed to be restored and conserved and there were not enough human resources to deal with the various threats. It's a protected area of rare and outstanding beauty, with laurel trees, oaks, cypresses and cedars. But the forest was becoming overgrown with invasive alien plants like acacias and river spiderwort.

I am guided in the work by the coordinating team. The activities are very specific and require good practices. For simpler tasks, our youth group is able to do the work without guidance.

By volunteering, I have learned to work with a team and to manage resources. And I've learned specific techniques and procedures to deal with plants and ecosystems. When I first saw the invasive alien species in the mountains, I could not even identify them. Today, I know them and I know the harmful effects of their proliferation, especially their influence on the growth of other native species of the forest.

I consider it important to volunteer to grow professionally and personally. Volunteers know how to work better as a team. You are in contact with different realities from your daily life. In personal terms, it is very comforting to contribute to a better world!"

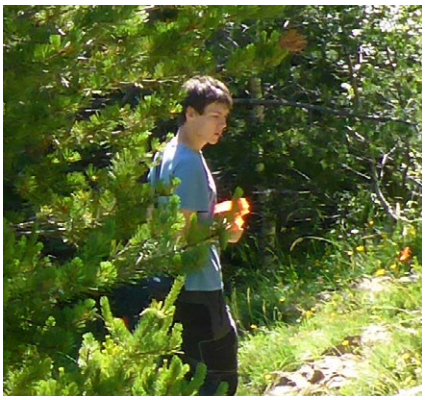
"The National Forest of Buçaco boasts a remarkable botanical and scenic heritage, with a large number of gigantic, century-old trees."

Description in UNESCO tentative list of World Heritage Sites

BRIGHT's volunteer network:

3 500 volunteers from NGO networks and social care institutions
More than 1 500 private sector volunteers
31 companies

Pursuing a passion for Pyrenean plants



Víctor Ezquerra is a 21-year-old Spanish biology student with a love of plants. In 2015 he began to pursue this passion as a volunteer for the plant monitoring network set up by the Pyrenean Institute of Ecology (CSIC) in the project LIFE RESECOM.

"I decided to join the LIFE RESECOM volunteer training programme because I wanted to become part of the world of high mountain plant species investigation. I wanted to find out more about these plants and also about the techniques used to research and monitor them. The programme was set up in 2014 to monitor plant species and habitat types of Community importance in Aragón, Spain. There are currently around 100 other volunteers involved in the monitoring.

My work as a volunteer involves the long-term monitoring of two plant species found

"The knowledge that I have gained is fundamental for the work I would like to be involved in when I finish my studies."

in the Pyrenees (*Cypripedium calceolus* and *Galanthus nivalis*). I go on regular excursions into the mountains to sample and to find new populations of these species. During these trips I also note down other information that might be useful, such as population size or threats.

I have learned about the techniques and materials needed to be able to take plant samples professionally and how endangered species are monitored within the framework of a project. The field work has helped me to get to know the Pyrenean plants and their ecology much better.

Volunteering has also been a great experience for me on a personal level. Not only have I learnt more about plants, I have met some great people with the same interests. In addition, the knowledge I have gained is fundamental for the work I would like to be involved in when I finish my studies. Experience in sampling and identifying plants is indispensable if you want a career studying the dynamics of plants.

The LIFE RESECOM project is important for two reasons: Firstly, the data collected helps us to better understand the current state of the species monitored. Secondly, it raises awareness about the importance of nature conservation and shows people how they can get involved. This kind of EU-funded project really teaches people about the value of European biodiversity, provides them with a global perspective and shows them how they can help to make a positive difference."

Maria Begoña García, trainer of volunteers, CSIC

"The long-term success of the RESECOM plant monitoring network will depend on our ability to keep volunteers enthusiastic by ensuring that they get something back from the experience. Thankfully many of them already feel that they gain a lot from taking part. In a survey we did in 2016 most said that they enjoyed the work and that they learnt a lot about the natural history of their "adopted" plants as well as about monitoring and sampling methods. They also learn about scientific accuracy, why things are done one way and not another and about how important a collaborative project is for increasing our knowledge about the dynamics of biodiversity. These are major life skills."

The bear necessity of corporate volunteering

Ibán Chico de la Felicidad heads up the corporate social responsibility team at GAS NATURAL FENOSA, a Spanish gas and electricity company. He explains the multiple benefits of getting involved in brown bear conservation in Cantabria.

Photo: Fundación Oso Pardo

Photo: LIFE07 NAT/E/000735/Fundación Oso Pardo

"20 volunteers from GAS NATURAL FENOSA took part in a project called LIFE BEAR DEFRAGMENTATION. They planted over 150 trees typical of bear habitats – cherry, rowan, silver birch - in a 'corridor' that links two sub-populations of the Cantabrian Brown Bear in the Los Argüellos Biosphere Reserve in northern Spain.

The tree planting was coordinated by two conservation NGOs - Fundación Oso Pardo and the Global Nature Foundation. The aim is to improve the connectivity between breeding groups of bears to facilitate genetic exchange between the two isolated populations and ensure they can survive.

We've been helping to fund actions to conserve the Cantabrian brown bear in Spain since 2002. One way has been by supporting the production of educational materials for local interest groups, such as schoolchildren and hunters, that aim to transmit good practices in bear conservation. Since 2012, our employees have been contributing on the ground as part of our commitment to natural capital.

This is part of an initiative we run called the Corporate Environmental Volunteering Programme. The aim is to encourage a positive attitude to environmental conservation among our employees.

We think this also helps to make for happier and more productive workers. We firmly believe that such activities also contribute to stimulating corporate values such as pride in belonging to the organisation, developing collaborative attitudes and specific skills and improving the reputation of the company.

In 2016, more than 500 people took part in our volunteering programme, donating a total of 2 457 hours of labour. Carrying out practical work to improve areas near their work centres and learning about and participating in the company's commitment to protecting biodiversity gives our employees a positive attitude to preserving the natural environment."

List of featured projects

***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

KH-01-17-422-EN-N

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

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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).

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LIFE Publication / LIFE greening jobs and growth

Publications Office

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