Bangor - Sustainable post industrial land restoration and re-creation of high biodiversity habitats

LIFE99 ENV/UK/000211

Project description Environmental issues Beneficiaries Administrative data

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Contact details:

Project Manager: J.C. WILLIAMSON
Tel: +44(0)1248/382532
Fax: +44(0)1248/383646
Email: j.c.williamson@bangor.ac.uk

Project description:

Background

It is estimated that there is 6,000 ha of damaged/derelict former industrial land in Wales, much of which is slate waste tip. Similar slate waste tips are found throughout the UK and in France, Spain and Germany, and there are many non-toxic mineral extraction sites throughout the EU. Little of this land will be used for residential or commercial development, but sites are often in areas of high quality landscape and are suitable for ecological/environmental restoration. Mineral operators are now aiming to restore these sites in the most cost-effective, environmentally friendly and socially acceptable way.

Objectives

The project was designed to demonstrate a new, cost-effective and sustainable method that would greatly accelerate the ecological/environmental regeneration on non-toxic post-industrial land that is desertified due to the presence of coarse substrate material. The restoration work was primarily based in Penrhyn Quarry, the largest slate quarry in Wales. In the 2nd and 3rd years of the project, demonstration plots were also to be placed by the LIFE team at quarries in Spain (Villar del Rey) and Ireland (Morrissey). The work was to involve the development and demonstration of novel technologies and vegetation regeneration strategies for these sites in close liaison with all the partners including local organisations and people. The project team aimed to re-create semi-natural conditions of high biodiversity value and significantly reduce the negative visual impact of the sites. The methodological structure used was to incorporate environmental, landscape, heritage and socio-economic survey, novel soil conditioning technologies, improved genetic selection of planting material, and adaptation of natural
regeneration and primary successional processes in modern ecological strategies. Key objectives: . Assess the environmental, conservation, biodiversity, socio-economic, landscape and heritage opportunities and impacts of the restoration activities; . Compare the rate of vegetation regeneration in demonstration plots against unmanaged controls; . Obtain information on the most cost-effective combinations of suitable restoration methods for different environments; . Compare the impact of alternative substrate ameliorative techniques; . Develop generic protocols for all stages in the restoration process; and . Quantify timescales and costs required to achieve ‘full’ semi-natural habitat creation. The project was also to provide local authorities with a ‘best practice’ model to improve planning strategies in relation to existing or planned industrial sites of this type, thereby raising environmental awareness in the industry. Simultaneously, the industry was to benefit from a cost-effective method for reducing its negative environmental impact without sacrificing its competitive ability as encouraged by Agenda 21 and the 5th Action Programme on the Environment.

Results

Task 1 - Survey, mapping and site preparation Objectives of the task: To complete site landscaping and to survey, map and delineate the demonstration plots. Deliverables: Survey of environmental and landscape zones, landscaping of sites. Result: Task completed (five months behind schedule). Task 2 - Production of plant material Objectives of the task: To obtain and cultivate large amounts of genetically similar material of local provenance suitable for field experimentation. Deliverables: Seed collection, means of establishment of 5,000 trees and 20,000 heather plants of local provenance Result: Task completed. 5,000 trees and 20,000 heather plants established. Task 3 - Assessment of socio-economic impact of Penrhyn project Objectives of the task: To assess the socio-economic impact of the Penrhyn Quarry restoration programme. Deliverables: Completed survey of socio-economic impact of restoration programme, incorporation of survey data into Geographical Information System (GIS) Results: Task completed. The Environmental Impact Assessment (EIA) for Penrhyn Quarry covered socio-economic issues including employment, dust, traffic and noise pollution. A second survey solicited views on restoration outcomes from the non-resident public interviewed in other parts of the UK. Data from both surveys was incorporated into the GIS in April 2001. Results of the EIA suggest that survey participants are positive about the changes that will be made at Penrhyn Quarry under the project. Task 4 - Design and implementation of demonstration plots at Penrhyn Quarry Objectives of the task: Development and implementation of methodology and design of demonstration plots. Deliverables: Purchase of equipment, complete construction of the demonstration plots Results: Five demonstration trials were established at Penrhyn Quarry (namely A, B, C, E and F). Each plot tested different techniques for establishing trees and heather in a wide range of locations, and included monitoring equipment, fencing and demarcation. All plots were established by September 2000. Good design practice recommendations were made in the Best Practice Manual, which was published as a final output of the project. Task 5 - Implementation and validation of monitoring programme Objectives of the task: Implementation and validation of the environmental monitoring program. Deliverables: Confirmation of validity of environmental monitoring program.
Results: Protocols were established for Health and Safety (both laboratory and field-based), data handling, plant production, planting, assessing plant success, sampling (quantity and frequency), analyses (quantity, type and accuracy), equipment function (laboratory and field-based) and project impact (take-up). Recommendations were made in the Best Practice Manual. Task 6 - Biodiversity measurement Objectives of the task: To measure biodiversity at Penrhyn Quarry. Deliverables: Measurement of abundance of detritivores and insect herbivores, plant nutrient analysis, quarterly bird counts. Results: Included surveys of detritivores and insect herbivores, plant nutrient analysis, soil analysis, and bird counts. The project team successfully worked jointly with another UK LIFE project (LIFE99 ENV/UK/000184-Toolkits for Community-led Regeneration of Derelict Land) on this issue. Monitoring took place throughout the lifespan of the project, and is also planned to continue after the project ends. Task 7 - Tree establishment trials Objectives of the task: Implementation of the plant establishment and monitoring programme at the Penrhyn Quarry tree sites, North Wales. Deliverables: Planting of birch and willow trees, monitoring of plant success, monitoring of environmental chemistry at the demonstration site. Results: Trial A: Addressed tree establishment on flat areas and utilised cell-grown plants Trial B: Addressed tree establishment on blocky slopes and utilised seeds, cell-grown plants and cuttings. Results included in the Best Practice Manual. The task was completed in a timely manner. Task 8 - Heathland re-establishment Objectives of the task: Implementation of the planting and monitoring programme at the Penrhyn Quarry heather sites. Deliverables: Planting of heathers, monitoring of plant success, monitoring of environmental chemistry. Results: Monitoring under this Task covered three LIFE project trials sites (C, E and F), and two trial sites previously set up by the Slate Ecology Company. Results included in Best Practice Manual. The task was completed in a timely manner. Task 9 - Spanish site Objectives of the task: Implementation of the plant monitoring programme at Villar del Rey site, Spain; a site with a very similar (slate) substrate to Penrhyn Quarry but very different climate conditions. Deliverables: Advice regarding the planting of birch and willow trees, advice regarding the monitoring of plant success, measurement of water status at the site. Results: LIFE project team members from Wales visited and designed a trial for the site, and supervised the management of the trial (which was carried out by local staff). The case study from this trial is included in the Best Practice Manual. Task 10 - Irish site Objectives of the task: Implementation of the plant monitoring programme at Dan Morrissey Ltd, Ireland; a site with a similar climate but a different (though non-toxic) substrate to Penrhyn Quarry. Deliverables: Advice regarding the planting of birch and willow trees, advice regarding the monitoring of plant success, use site as a case study in the Best Practice Manual Results: The project achieved their proposed deliverables, and have added an additional deliverable (interim report) to use the site as ‘A case study in the Best Practice Manual, further illustrating standard protocols for approaching the restoration of quarry waste’. Unfortunately the project team had difficulty in maintaining contact with the local partner and have discontinued their efforts to engage them. Task 11 - Assessment of substrate amendments Objectives of the task: Assessment of the substrate amendment techniques in field studies. Deliverables: Incorporation of substances for substrate amendment into field studies in parallel with Tasks 7,8,9 and 10, determination of water and nutrient capture / release of the substances, determination of the expected lifespan of the substances. Results: Since slate quarries provide a particularly difficult substrate for the re-establishment of vegetation, the project carried out research into the
effectiveness of a range of substrate amendments. The Best Practice Manual contains a section on soil handling and substrate amendments with soil forming potential. Other academic papers and an abstract of an MSc developed from this task. Task 12 - Analysis Objectives of the task: Economic and cost-effective analysis of the restoration programme. Deliverables: Determination of cost/benefit ratio of restoration program Results: A cost-benefit analysis of restoration outcomes was performed. This involved comparing four restoration options with each other. The management options were identified as: Conservation, Landscape, Heritage and recreation. Un-restored Additionally a number of different methods were used to calculate the net present values for the restoration options, these were then compared. The results of the cost benefit analysis suggested that the conservation and landscape management / restoration options offered the highest net present values.

Environmental issues addressed:

Themes

Industry-Production - Mining - Quarrying
Risk management - Site rehabilitation - Decontamination

Keywords

quarry, abandoned industrial site, site rehabilitation, cost-benefit analysis, biodiversity, land restoration

Target EU Legislation

- Nature protection and Biodiversity
- Directive 79/409 - Conservation of wild birds (02.04.1979)
- Directive 92/43 - Conservation of natural habitats and of wild fauna and flora- Habitats Directiv ...
- COM(98)42 -"Communication on a European Community Biodiversity Strategy" (05.02.1998)

Natura 2000 sites

Not applicable
Beneficiaries:

Coordinator: Institute of Environmental Science, University of Wales
Type of organisation: Research institution
Description: The Institute of Environmental Science is a facilitating body for the integration of environmental sciences at the University of Wales, Bangor. The University is well established and respected for the quality of teaching and as a world class research institution. It has 8,000 students from the UK and the rest of the world.

Administrative data:

Project reference: LIFE99 ENV/UK/000211
Duration: 01-OCT-1999 to 01-OCT-2002
Total budget: 1,076,410.02 €
EU contribution: 528,886.34 €
Project location: Wales (United Kingdom) Northern Ireland (United Kingdom)

Read more:

Brochure: Title: Restoring Habitats of High Conservation Value after Quarrying - Best Practice Manual
Project web site: Internet site
Publication: Title: Layman report Year: 2002