



SCOTTISH EXECUTIVE

Enterprise and Lifelong Learning

Green Jobs Strategy Review



GREEN JOBS STRATEGY REVIEW

Prepared by Optimate Ltd

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Job Creation in Sustainable Industries

There is considerable interest across the developed world in creating sustainable economic strategies which limit impact on the environment. In Scotland, the Scottish Executive plans to implement a 'Green Jobs Strategy'. Three areas have been initially identified, which could provide future growth and employment opportunities for Scotland, namely renewable energy, waste management & recycling and cleaner technologies & processes. The Scottish Executive will undertake a major consultation exercise in summer 2004 to obtain wider opinion on this strategy.

A number of governments and their agencies, both in the UK and overseas, have developed, or are in the process of developing, policies which create employment in sustainable industries. This study investigates these policies, providing an opportunity to learn from current experience and best practice.

Main findings

'Green Jobs' Creation

Very few governments have developed 'green jobs' strategies. Many have broad sustainable development policies, with interventions designed to help meet international regulations. These are supported by economic development policies designed to simulate the growth of specific environmental technology markets. These typically do not have specific job creating objectives.

Denmark and Sweden are exceptions as both ran 'Green Jobs' creation programmes in the late 1990's as a part of broader environmental economic development policies. These were moderately successful, creating approximately 1,000 permanent jobs in Denmark and 600 in Sweden.

Organisations such as the Friends of the Earth, WWF, the Canadian Labour Congress and FEESE (Fostering Employment in the Environment Sector in Europe) have suggested policies to promote the development of employment in sustainable industries. The FEESE recommendations in particular are useful as they are based on studies into environmental employment creation activities in Germany, Sweden and Finland.

Drivers

The majority of investment in the development of environmental industries in Europe is driven by EU legislation, particularly national targets set out in the Renewables Directive and the Landfill Directive.

Interventions

The policy interventions that are used by governments to promote sustainable development fall into four categories: regulatory instruments, economic instruments, public/information instruments and land use/urban planning. Economic and regulatory instruments are the most commonly used, with economic instruments increasingly preferred. This is because they typically have the dual benefit of reducing unsustainable activities and raising funds to support sustainable activities.

Denmark as an example of best practice

The most effective policies for jobs creation in sustainable industries are those which combine national industrial and environmental policies. Denmark's policies can be regarded as best practice, with the country seen to be the world leader in the development of environment-focused economic policy. This focus is being maintained despite the fact that the Green Party, which invested heavily in the development of environmental technology capabilities, is no longer in power.

The Danish Government has recently scaled down its investment in renewable energy, becoming more selective about investment in the development of environmental technologies. It is using cost benefit analysis and market based instruments to achieve more cost effective solutions. The country is still expected to maintain its lead in wind

energy and carve out a substantial market share in other technologies such as energy from waste.

Sustainable industry support

Investment in the development of specific technologies or industries is a very effective way of creating long term, and often high value employment. This can be seen in Denmark and Spain with wind energy, in Germany and Japan with photovoltaics and in the US and Canada with fuel cells.

For example, Denmark's policy of supporting the development of the wind industry has, according to the Danish Wind Industry Association, led to the country's dominance of the wind energy market and the creation of over 20,000 jobs. The expertise developed in wind energy has also helped support the growth of other renewable energy technologies.

Opportunities & capabilities

There are significant growth opportunities for Scotland in the three key markets studied: renewable energy, waste management & recycles and cleaner technologies & processes. These markets are at different stages of development with marine technologies in particular offering opportunities over the long term. Scotland has the opportunity to become a world market leader in wave and tidal technologies.

Scotland has significant capabilities both within these industries and within industries requiring similar skills, experience and infrastructure. Expertise developed in the oil & gas industry, for example, will underpin the development of offshore renewables.

Research Methods

The report is based on desk research using secondary market research, internet searches and other published information in the public domain.

Jobs Creation in Sustainable Industries

Introduction

Considerable local, regional and national government interest exists in creating sustainable economic policies which limit the impact of growth on the environment. However, due to the diversity of, and considerable overlap in, environmental technology and related sectors and sub-sectors there is no recognised or agreed definition of what constitutes 'Green Jobs'. This has caused confusion and made it difficult for policymakers to set boundaries for economic development. A number of governments and their agencies, both in the UK and overseas, have developed, or are in the process of developing, policies to create jobs in the environmental industries as part of their future plans for sustainable economic development. This provides an opportunity to learn from current experience and best practice.

The Scottish Executive also plans to implement a 'Green Jobs Strategy' to stimulate future economic growth and sustainability. Three areas, relating to the supply of goods and services that will benefit the environment have been initially identified as having particularly strong potential to provide future growth and employment opportunities for Scotland, namely:

- Renewable energy e.g. wave, tidal stream etc
- Waste management, recycling and recyclates (products)
- Cleaner technologies and processes e.g. equipment to improve efficiencies

Growth in these areas is being driven to the EU Renewables Directive and the EU Landfill Directive. As with all EU governments, the Scottish Executive has set out policy and funding commitments to help meet these targets. Business support is being undertaken by organisations such as the Enterprise Networks, including activity relating to market creation and stimulation. Examples include diversification programmes to help existing companies transfer capabilities into renewable energy.

The Scottish Executive will undertake a major consultation exercise in summer 2004 to obtain wider opinion on a future 'Green Jobs Strategy' for Scotland. Scotland however, already has considerable resources, capabilities and competencies in wider environmental

sectors that could be further developed as part of a future 'Green Jobs Strategy' and there is a risk of missed opportunities for jobs creation.

Most of the environmental sectors have already been evaluated in terms of future market prospects. An opportunity exists therefore to review additional scope to create jobs in sustainable industries in Scotland.

Project Plan

This project was designed to highlight opportunities to provide a range of activities that will support the Scottish Executive in the development of a future 'Green Jobs Strategy' for Scotland. The project was carried out in two phases.

Phase 1. International Strategy Review

The main objectives of the review were to:

- identify UK and overseas developments in job creation in sustainable industries at a national and regional government level
- assess current and, where possible, future green fiscal and intervention policies
- evaluate what impact (if any) intervention strategies have had on the development of jobs in sustainable industries

The review is based on desk research using internet searches, secondary market research and other published information in the public domain.

Phase 2. Opportunity / Capability Profile

The objective of this phase was to assess potential opportunities to create jobs in the Scottish Executive's three areas of interest: renewables, waste management & recyclates and cleaner technologies.

We undertook a review of future opportunities for employment creation relating to goods and services in each sector, based on global market size and growth rate forecasts. This included an assessment of opportunity development requirements and supply chain issues for each market sector.

An opportunity / capability table has been used to identify areas where there is a strong fit with Scotland's existing capabilities, and where there are capability and skills gaps. It also

highlights those areas holding the most promise for new and existing Scottish businesses and in which government intervention is likely to yield the best results.

Leading strategies for job creation in sustainable industries

Overview

Very few governments have developed specific 'green jobs' strategies. Many have broad sustainable development policies, with environmental considerations influencing economic policy, but these typically do not have specific job-creating objectives. Denmark and Sweden (to a lesser extent) are exceptions. They are seen to be world leaders in the development of environment-focused economic policy and have specific 'green job' creation objectives and programmes.

Organisations such as the Canadian Labour Congress, Friends of the Earth and FEESE have developed specific 'green jobs' policies/recommendations and lobby governments to have them implemented.

Countries

The table below summarises the activities of countries that are active in the development of employment in sustainable industries and/or sustainable technologies. A broad indication of the impact these have had on employment or industrial development is also shown.

Country	Regulation, taxes & charges	Grants & subsidies	Green market creation programme(s)	Extensive green procurement	Information & education	Impact
Denmark	●	●	●	●	●	20,000+ jobs and market dominance in wind, leaders in energy from waste
Sweden	●	●	●	●	●	High value job creation in broad range of industries
Germany	●	●	●	●	●	Largest market for wind energy, European market leader in photovoltaics
US	●	●	●	●		1.1 million jobs in recycling / reuse, \$1.7bn investment in fuel cell development
Canada	●	●	●	●		Global leader in fuel cell technology development
Spain	●	●	●			Second largest market for wind energy
Japan	●	●	●			World market leader in photovoltaics
France	●	●				Regional cluster development of environmental technologies
UK	●	●				World leaders in wave & tidal stream technologies

The following country profiles provide an overview of strategies which have been designed to create jobs in sustainable industries, where they exist, and the targeted development of renewable technology industries.

Denmark

Denmark is recognised as the leading country in the world in the development of green economic policy. Its policy of fostering green economic growth has been in place since the early 1990's. A timeline of Denmark's green industrial development is given in Appendix C and is summarised below.

Early 1990s

- Green procurement policy for public institutions

1993 to 1997

- Detailed regulation and control, with target setting and subsidies for renewable energy
- Introduction of green taxes with a focus on energy and transport

1997 to 1999

- Policies to support the research and development of new products and processes, and to promote new technology uptake
- Development of a 'Green Jobs' concept and policy, leading to the creation of 1,000 permanent jobs

1999 – 2002

- Sustainability is a driving force in industrial policy
- Government conducts a dialogue with over 300 CEOs, leading to the development of a 'Green Business Strategy' (see Appendix B) – substantial funding for environmental technology development
- Shift in policy to promoting environmental protection through technological innovation

2002 +

- New government in power, in which the Green Party is no longer a majority
- Innovation and development funds cut and subsidies cut
- Focus on the use of cost benefit analysis and the achievement of cost effective solutions through the use of market-based instruments (see Appendix B and below)

- Increased use of international partnerships to spread development costs and risks

The Danish Government's latest policy statement (from 2003) is 'Making Markets Work for Environmental Policies', which focuses on making better use of free initiative and market-based mechanisms to solve environmental problems. Economic instruments, regulatory and voluntary instruments (agreements, labelling, technological innovation) are being used to influence market players.

Future cleaner product initiatives will include a focus on information, innovation and the dissemination of environmentally friendly products. The initiatives will target specific product groups which are judged to be of economic and environmental significance. The focus will be on creating partnerships and dialogue with market players concerning the supply, marketing and demand for cleaner products. The Government intends to initiate a 'dynamic process involving a simultaneous increase in both the supply and demand for environmentally friendly products and services, where the environment is a much more important competitive factor in the market than is the case today'.

The existing Danish domestic market for environmental technology solutions is not large enough to develop competitive enterprises on the global market. Denmark recognises, however, that environmental technology innovation is an area where the country has strengths. It plans to strengthen its cooperation with EU partners and believes it has 'a good chance of becoming a pioneering force in globally furthering a green industrial development...and that Danish companies may obtain a strong competitive position in the global market of the future'.

As it has limited resources, the Ministry of Science, Technology and Innovation is carrying out technological foresight analyses in order to prioritise environmental technology innovation initiatives. It is also investigating ways in which environmental technology research can be incorporated into R&D within specific technology areas, such as nanotechnology. It plans to strengthen the interaction between industry and knowledge institutions to achieve better and less expensive solutions.

Sweden

The Swedish Government's Environmental Code, introduced in 1999, built on and replaced 15 separate environment laws. It includes measures to strengthen competitiveness in the

environment-related sector, through entrepreneurship, the involvement of consumers, export promotion, etc. Initiatives which have an impact on the creation and support of jobs in sustainable industries are public procurement, industry consultation, innovation & export support, networking, the renewable energy programme and the Local Investment Programme. These are outlined in Appendix B.

The initiative that has had the greatest impact on 'green' jobs is the Local Investment Programme, which provides grants to Swedish municipalities, with the joint aims of increasing the pace of the changeover to sustainability and creating new jobs. During the period 1998-2001, local investment programmes created approximately 11,500 'years of work' and generated around 600 permanent jobs (in a wide variety of sustainable industries), lasting after 2001. It also created new technologies, new methods and new markets, particularly in the areas of energy efficiency and biogas production from organic waste.

Germany

While Germany does not have specific policies for creating employment in sustainable industries, it has a strong track record of supporting the development of markets for sustainable technologies. The majority of support has been legislation driven, particularly in waste & recycling and wind energy, where strong markets have developed. Its current 100,000 roofs programme, which provides householders with grants to install solar energy systems, has made Germany the leading European producer, developer and exporter of photovoltaics.

USA

As with Germany, the US focuses on market creation, rather than job creation. A combination of national programmes and state-based programmes are used to support the development of environmental technologies. Individual states are responsible for the development of both environmental and employment policies. Examples of national programmes include a \$1.7bn investment over 4 years in the development of fuel cells, and the million roofs project which provides grants for the installation of domestic photovoltaic systems. State-based programmes include the Renewable Energy Assistance Programme in Wisconsin and the Green Building Tax Credit in New York (both discussed later in the report).

The US has developed a substantial waste recycling market, much of this driven by market forces, rather than specific government interventions. Statistics show that more than 1 million jobs have been created in recycling and reuse.

The Environmental Trade Promotion Working Group develops strategies to promote the development of environmental trade. It also provides a package of technical and legal assistance to companies looking to export. It has been successful in assisting US waste management companies to enter emerging and developing markets.

Canada

Canada has a 'Federal Vision for Sustainable Development to 2025' and a 'Sustainable Development Strategy for 2004-2006'. The latter contains an element of jobs-related economic development, with one its four themes being the use of innovative economic instruments to develop and support sustainable development, including the use of innovative agreements with industry to further sustainable development goals. The focus is on encouraging industry to embrace sustainable production through the use of economic incentives and instruments.

Human Resources Development Canada (HRDC) has its own 'Sustainable Development Strategy for 2004 to 2006'. HRDC's mandate is 'to assist all Canadians in their efforts to lead rewarding lives, as well as to promote a fair and safe workplace, a competitive labour market with equitable access to work, and a strong learning culture'. The 'green jobs' element of their strategy focuses on getting the disabled, aboriginal and long-term unemployed into work and does not have a specific economic development focus.

Examples of sustainable job creation activities by various Government departments under the banner of sustainable development are given in Appendix B.

Canada has recently invested in the development of its fuel cells research and development capabilities. In a recent DTI report, Canada was seen to be the world leader in this embryonic market. In the long term, this should lead to the development of a large number of jobs.

Spain

Much like Germany, Spain has invested heavily in the use of wind energy and in the development of its wind energy industry. It is currently the second largest market in Europe for wind energy and its major producers are active in the international market. Figures were not available for the number of jobs created.

Japan

Japan has invested heavily over a number of years in the use of solar energy, both domestically and commercially. It is the world leader in the development, production, use and export of photovoltaic systems. It is currently supporting the development of technologies for biomass and energy from waste, as well as funding fuel cell development.

France

In order to meet its obligations under the EU Renewables Directive (21% of electricity consumption by 2010), France has set renewable energy targets for biomass, wind energy, geothermal energy, small hydro and biogas, with the most significant being for wind. Here it aims to make wind energy profitable for small investors and to open a wide range of sites across France. Feed-in tariffs and investment subsidies are being used. It is currently behind target.

Independent of the support for renewables, pockets of environmental expertise have developed in France. The regions of Rennes and Lyon, for example, have both developed a very strong focus on the environment sector. Both have a large number of primarily small companies, supported by specialist courses run at the local colleges and universities, with which strong links have been established. With limited government investment, these regions have over time become national centres of expertise in the environment.

UK

Within the 1999 strategy 'A Better Quality of Life: a Strategy for Sustainable Development', the UK Government provides a wide range of objectives, all of which have an impact on the development of jobs in the green economy. Its sustainable consumption and renewable energy objectives and initiatives are given in Appendix B.

Support for technological development in new and renewable energy falls under the Technology Programme and is delivered through the new Collaborative R&D business support product.

In addition, the DTI's Capital Grants Scheme funds demonstration projects, both reducing the costs and risks involved and helping the Government to meet its targets for renewable electricity supply within the UK. The New Opportunities Fund is also contributing £50 million to renewable energy projects, as a part of its Transforming Communities Programme.

This funding is split between three key priorities:

- offshore wind projects
- projects generating electricity from energy crops
- small-scale biomass heating schemes

Wales

Wales has not produced policies that are specifically targeted at creating jobs in sustainable industries, but at the outset of the Welsh Assembly it made a core commitment to sustainable development, which has now developed into a proactive approach to green economic development. This is set out in 'A Winning Wales: National Economic Development Strategy of the Welsh Assembly' and is based on the UK Government's 'A Better Quality of Life: A Strategy for Sustainable Development for the United Kingdom'.

Its economic development vision is 'to achieve a prosperous Welsh economy that is dynamic, inclusive and sustainable...[and that] economic growth is not sustainable where the interests of the environment and our established communities are disregarded'.

Details of the Welsh Strategic Plan, which should have an impact on the development of employment in sustainable industries, are given in Appendix B.

EU/EC

The EU has a sustainable development policy, which feeds into the national Government sustainable development policies. It does not have a specific policy targeted at creating 'green' jobs.

The EC has identified sectors where there is a positive link between environment and employment. They recommend that these sectors should be the focus of supportive policy measures at European, national and local level. These are detailed in Appendix B.

Organisations

Canadian Labour Congress

The CLC is a labour union which works closely with Environment Canada, the Government's Environment Agency. It has developed a policy framework for a Green Job Creation Campaign, including a definition of a Green Industrial Policy. Details are included in the Appendix A.

Other Canadian labour unions also have 'green jobs' policies. The Communications, Energy and Paperworkers Union, for example, has a policy which focuses on renewable energy, energy efficiency and public transportation, and the Industrial, Wood and Allied Workers Union is focused on securing federal investment for intensive silviculture and just transition programmes.

Friends of the Earth

In 1998 Friends of the Earth prepared a document called 'Making Jobs Green' as the UK component of a European project coordinated by the European Environmental Bureau. The aim of the project was to raise awareness of economic activities that simultaneously protect the environment and create jobs. Its specific aims in agriculture, manufacturing, sustainable energy, transport and water are included in Appendix A.

FEESE

FEESE (Fostering Employment in the Environment Sector in Europe) is an EU-funded organisation which investigates employment trends, provisions and needs in the field of environmental technologies

Research carried out by FEESSE in the environmental industry in Germany, Sweden and Finland came up with very similar issues and recommendations for the three countries. These are summarised in Appendix A.

International policy interventions

EU policy instruments/interventions

Within Europe, European Directives have stipulated the environmental responsibilities of Member States and EU based companies, helping to stimulate the market for 'greener' products and processes. Four main economic instruments are used in EU sustainable development policies:

- Charges and taxes: environmental charges/payments made on the use of the environment, e.g.
 - emission charges/taxes, based on the quality or quantity of the pollutant
 - product charges/taxes, levied on products that are harmful to the environment either when produced, consumed or disposed of
- Marketable permits or emission trading – environmental quotas which, once allocated by the relevant authority, may be traded internally or externally.
- Deposit-refund systems – payment of a deposit on a potentially harmful product. When the expected pollution is avoided, the deposit is returned.
- Subsidies for environmental purposes – financial assistance ranging from grants to soft loans and tax breaks, acting as an incentive for polluters to change their ways of operating.

Based on EU policy, regulations on emissions and the development of Best Practice Environmental Options within the UK have already led to a growth in demand for green products. The Scottish Executive has the ability to develop targeted policies to build on this regulation.

ISSD policy instruments/interventions overview

According to the International Institute of Sustainable Development, many existing and emerging policies tend to prioritise short term economic and social objectives at the expense of long-term environmental sustainability. It points to increasing evidence of the close linkages between economy and environment suggesting a need to rethink existing policies. It breaks down the instruments/interventions that can be used to support long term sustainable development into the following four categories :

- Regulatory instruments
- Economic instruments

- Public/information instruments
- Land use/urban planning

A further breakdown of these categories and examples of actual interventions are given in the following pages.

Regulatory instruments

A broad range of regulatory instruments are used by governments around the world. The majority of these are used to help countries meet international commitments. Examples include performance standards, ambient standards, technology standards, limits, bans, prohibitions, phase outs and quotas.

The following examples are specific to Germany, but could be implemented elsewhere.

Car Takeback Decree

Germany passed legislation which underpins a producer responsibility agreement formed between the government and the car industry. Under the agreement, manufacturers take back end-of-life vehicles at no cost to the last owner and without imposing a surcharge in the price of a new car. It aims to reduce the share of non-recoverable parts from 15% in 2002 to 5% by 2015.

Azo dyes prohibition

Germany prohibits the import of textiles containing certain azo dyes, which account for 70% of all dyes used and could release any of 20 harmful amines. This regulatory instrument was also implemented to encourage the production of organically grown cotton, as well as prompting large textile mills to invest money into researching substitutes for banned substances.

Packaging decree

The German Packaging Decree promotes refillable packaging as ecologically advantageous. Defying an ongoing legal challenge from the European Commission (which sees the system as anti-competitive as importers do not have the necessary systems in place), as well as pressure from parts of industry to abandon it, the proposed decree retains the country's

72% refill quota for most beverage containers. A mandatory deposit is paid on all one-way packaging if the 72% rate is not achieved.

Economic instruments

Economic instruments are increasingly preferred to regulatory instruments as a national means of promoting sustainable development. This is because they typically have the dual benefit of reducing unsustainable activities and raising funds to support the development of sustainable activities. Economic instruments include:

- Fiscal instruments, charge systems & financial mechanisms, e.g:
 - Taxes on pollution, inputs, products, land use, royalties & resource;
 - Tax differentiation, investment tax credits, accelerated depreciation, other tax exemptions/allowances, subsidies
 - Charges on emissions/effluent, depletion, inputs, products, users, access fees, road use
 - Feebates, where producers or consumers pay a flat fee for an action, but are compensated if production/consumption falls below a specified level
 - Grants/soft loans, environmental or green funds, debt-for-nature swaps, distributive credits, location/relocation incentives
- Market creation - tradeable emission permits, catch quotas, water shares, resource shares
- Property rights - land titles, water rights and use rights
- Green procurement - joint implantation, deposit-refund systems, performance bonds

Some examples of successful policies implemented in the 1990's are given below.

Pollution taxes in Denmark

The aim of the tax was to encourage substantial savings in energy and encourage the growth of cleaner energy and renewable energy. Most manufacturing industries were targeted with new or increased pollution taxes, while income taxes were lowered. A CO₂ tax was also introduced (industry paying 600 Dkr (£70) per tonne of CO₂ for energy used for heating and 200 Dkr (£23) per tonne of CO₂ for energy used for production), with the income partly being used for energy efficiency measures. For energy-intensive production, the CO₂ tax can be exempted if the firm agrees to make use of the best available energy saving technologies.

Renewable energy assistance programme in the US

The aim of the grants / soft loans in this measure was to encourage the use of renewable fuels in Wisconsin, supporting companies that produce or use renewable energy with sales of less than \$100m. Grant awards of up to \$75,000 were available for eligible firms to assist them in assessing renewable fuel feasibility or to reduce the capital cost of installing renewable energy systems.

Green building tax credit in the US

In May 2000 New York introduced an incentive package for developers who build environmentally sound commercial and residential buildings. This 'green building credit' is aimed at encouraging the housing materials and construction industries to adopt green practices on a large scale by providing tax credits to building owners and tenants who invest in increased energy efficiency, recycled/recyclable materials and improved indoor air quality. The use of fuel cells, ozone-friendly air-conditioning and photovoltaics in particular is encouraged through the credit scheme. The hope is that economies of scale will be created, making greener products competitive with existing technologies in the domestic market.

Korean Deposit Refund Programme

The aim of the programme is to promote waste recycling. Producers of paper, metal cans, glass bottles, PET bottles, batteries, tyres, lubricants and home appliances are required to deposit money (the amount depending on the product) with the Ministry of the Environment. They then receive reimbursements according to their retrieval and treatment performance. The Korean Resources Recovery and Reutilisation Corporation purchase the products subject to this system and is responsible for their recycling. This has prompted the producers to take a great deal more responsibility for the recycling of their products.

Tax breaks for low-emission vehicles in Japan

As part of the Japanese government's commitment to reduce carbon dioxide emissions, it is providing consumers with tax breaks if they purchase hybrid and other low-emission vehicles (primarily produced by Nissan and Toyota). The Government has also overhauled the vehicles-related tax structure to reduce tax rates for vehicles with high fuel efficiency

and raise the rate for those with poor fuel consumption. The government has also imposed a road tax, a tonnage tax, and a petrol consumption tax on motor vehicles.

Wind energy programme in Denmark

Denmark levies a tax on all electricity and the major support mechanism for wind energy in the 1990's was a partial rebate of the this tax (a production subsidy of 0.27 Dkr per KWh for electricity generated from renewable sources). The aim of the rebate was to reduce CO2 emissions and to increase the share of Denmark's gross energy consumption provided by renewable energy to 35%, or perhaps even 50%, by 2030. The rebate scheme was supplemented by subsidies which are designed to convert central heating systems to district heating and to expand the existing district heating network. The Danish government also employs other policy instruments (see Appendix C) to encourage the wind energy industry, e.g. subsidies, grants, partnerships, regulations.

Scheme for funding green jobs in Denmark

Up until the end of 2000 (see Appendix C for details on Denmark's green industrial development), the Danish Ministry of Environment and Energy provided financial support for projects which create new jobs in environmental areas. All companies, organisations, public bodies and individuals with ideas for creating new jobs could apply for funding, up to a maximum of DEK 250,000, or 70% of costs of new and existing staff costs working on the project.

Public/information instruments

Public and information instruments include education & training, public information campaigns, eco-labelling, partnership projects, voluntary agreements and pollution release inventories. Examples of green purchasing and public information instruments are given below.

Green procurement in Sweden

The aim of the policy adopted by a number of municipalities in Sweden (from 1995) was to ensure that environmental criteria are included in municipal procurement policies. As old contracts expire, the policy states that specific criteria are used for the development of all new contracts. This includes, for example, that suppliers declare packaging, transport and

waste material. Products or services which are purchased and conform to the environmental criteria, or products which are eco-labelled, are separately coded. This makes it clear for each municipality how large a proportion of purchasing has been environmentally adapted. While no specific targets or penalties were set, it signalled to suppliers that they were more likely to win contracts if they were 'greener' than the competition. This has both increased the market for producers of green products and encouraged existing suppliers to the government to adopt green practices.

Federal Procurement Challenge in the US

The Federal Procurement Challenge is a voluntary, government-wide commitment that uses the buying power of the federal government to create new markets for energy saving technology and products. Agency heads commit their organisations to purchase products that are in the upper 25% of energy efficiency for all similar products. The Federal Energy Management Programme helps participants to identify energy-efficient products that meet their needs at a reasonable cost. Twenty-two federal agencies, representing 95% of federal purchasing are participating.

Green Seal in the US

Green Seal is an independent, non-profit organization which has developed a Seal of Approval for products and services. Working on Federal, industry and consumer levels, Green Seal promotes the manufacture and sale of environmentally responsible products. Its environmental standards are developed on a category by category basis (30 categories) and once a category is chosen, a study of the environmental impacts of the products is carried out. The proposed standards are then circulated for public review and comment.

The Green Seal Buyers Program also publishes a green buying guide to assist businesses to buy green products and services.

Green Seal consults with manufacturers on certification. If products do not meet Green Seal's standards, Green Seal will inform the manufacturer of the reasons and will work with the company to make the required changes, if desired.

EcoReDesign project in Australia

The Australian Government funded EcoReDesign Program (1997-2000) assisted Australian manufacturers from a wide variety of sectors to improve the environmental performance of their products through innovative R&D strategies. The project created case studies and produced an information video and manual for wider adoption by Australian companies, designers, engineers, and others involved in new product development.

Land use / urban planning

Possible interventions in this area include resource management, physical planning, waste collection systems and the development of mass transit systems. As such, these relate to the provision of core services by central and local government, or make up components of broad sustainable development policies. Large numbers of jobs can be created or maintained as a result of land use / urban planning interventions, but they are not typically designed with this in mind.

Opportunity / capability profile for Scotland

Overview

In this study, we have focused on the opportunities for Scotland in three key markets:

- Renewable energy
- Waste management & recycles
- Cleaner technologies & processes.

Profiles of these markets (renewable energy as a whole) are provided in Appendix E, including growth forecasts, drivers, opportunities, challenges and Scotland’s capability fit. These profiles are summarised below. Options for intervention are also provided, along with an assessment of the potential impact on jobs growth.

Markets overview & growth forecasts

Global environmental markets are forecast to grow at 2.9% per annum to 2010. Growth in the markets which are the focus for this study, will be much faster and there are substantial opportunities for Scotland in these areas. Although renewable marine energy and clean technologies industries are currently small, JEMU and Renewables UK (part of the DTI’s Renewable Energy Industry Directorate) forecast substantial global growth over the next 5 to 10 years as emerging and demonstration technologies are commercialised. These forecasts are summarised below.

	UK market size	Global market size	Global market growth rate	Forecast UK market	Forecast global market	Stage of development
Offshore wind*	0 MW in 2002	165 MW in 2002	82% p.a.	185 MW by 2007	3,254 MW by 2007	Emerging
Wave*	0 MW in 2002	2 MW in 2002	N/A	N/A	N/A	Emerging
Tidal*	0.15 MW in 2002	0.15 MW in 2002	N/A	N/A	N/A	Innovation & demonstration
Waste management & recycling**	£4.6bn in 2000	\$206.7bn in 2000	2.3% p.a. (7% in UK)	£9.05bn by 2010	\$258.4bn by 2010	Established. Growth for recycling / reuse
Clean technologies**	N/A	\$5bn in 2000	18% p.a.	N/A	\$26.2bn by 2010	Established & emerging

* World Offshore Energy Report 2002 - 2007, Renewables UK

** Global Environmental Markets and the UK Environmental Industry – Opportunities to 2010, JEMU

Renewable Energy

The renewable energy sector covers the supply of technologies and services for the generation, collection or transmission of energy from renewable sources such as biomass, solar, photovoltaic, wind, tidal and geothermal sources. It includes the manufacture of

equipment, design, construction, installation, management and operation of RE facilities. Approximately 1,500 jobs were sustained by the industry in Scotland in 2003, 22% of the UK total. Hydro power currently makes up the bulk of Scotland's current renewable resource, providing 11% of Scotland's electricity.²

The UK market for renewable energy was approximately £290m in 2002, with £80m attributed to Scotland, and forecast to grow at average of 12 to 15%% per annum to 2010.^{2, 3}

In Scotland, strong growth is forecast in wind projects as well as wave and tidal research. As biomass, solar and hydro have struggled due to regulation and lack of support, energy from wind is set to make up the bulk of new renewables capacity until 2010. Scotland is forecast to take a 39% share of the UK onshore wind power market by 2010, with significant growth in offshore wind.⁴

Waste management

The waste management sector covers the supply of products and services for waste collection, treatment, disposal, minimisation and recycling. With 72,000 employees, it is the largest environmental sector in the UK.⁵

The UK market for waste management was £4.6bn in 2000 and forecast to grow to £9bn in 2010. By 2020, Scotland is forecast to produce 4.6m tonnes of municipal waste, an additional 1.4m tonnes per annum compared to 2002. Scotland's target is to move away from the 91% reliance on landfill in 2002, to 31% landfill, with 69% recycling/composting/conversion to energy in 2020.⁵

Clean technologies & processes

Cleaner Technologies and Processes (CTP) aim to minimise waste at source by adopting integrated pollution control in place of end-of-pipe techniques. The JEMU definition of CTP is as follows:

2 Renewable Supply Chain Gap Analysis (Summary Report), DTI, January 2004

3 Global Environmental Markets and the UK Environmental Industry – Opportunities to 2010, JEMU, January 2002

4 Key Facts & Figures in the Renewable Energy Industry, Scottish Enterprise, January 2004

5 National Waste Plan 2003, SEPA/Scottish Executive

The supply of equipment and expertise for the cleaner, more resource efficient technologies, processes or products, which for example, decrease material inputs, reduce energy consumption, recover valuable by-products, reduce emissions or minimise waste disposal problems.

CTP encompass a range of disciplines including aspects of product design, materials technology, process engineering and process control.

As a relatively new environmental technology market, the CTP market is currently small. The global CTP market in 2000 was estimated at \$5 billion. North America and Western Europe are the largest regional markets with \$1.9 billion and \$1.8 billion respectively.⁶

The market is forecast to grow massively through to 2010. The Joint Environmental Markets Units (JEMU) predicts a \$26.2 billion global market in 2010, growing at a compounded annual growth rate of 18%.⁶

Although the deployment of CTP in the UK lags behind many other developed countries, there are signs that industry is beginning to switch from end of pipe solutions to integrated pollution control. A government survey of environmental expenditure by UK industry showed an almost doubling of integrated pollution control capital expenditure from 1997 to 1999, accompanied by a fall in end of pipe solutions.⁷

Scotland's capabilities

Expertise developed in existing industries can be transferred to support the development of these markets. Experience from Scottish wind industry and the oil & gas industries, for example, will underpin the development of offshore renewables. Current capabilities by category are summarised below.

⁶ Global Environmental Markets and the UK Environmental Industry – Opportunities to 2010, JEMU, January 2002

⁷ Environmental Protection Expenditure by Industry: 1999 UK Survey, DEFRA, 2001

Renewable energy

According to the DTI's gap analysis, 240 companies were active in Scotland in the production, development and export of existing and emerging renewable energy technologies. These provide 1,540 jobs.⁸

Approximately 150 of these companies are involved in wind energy, providing around 1,180 jobs (approx 77% of total renewable energy jobs) – 550 in development, 610 in construction and 20 operational.

According to research conducted by Scottish Enterprise in 2001, of the 116 companies involved in renewable electricity in Scotland at that time, 17 were manufacturers (8 in wind) and 51 were developers. The Vestas manufacturing wind turbine facility at Campbeltown currently employs 150 people. According to the research, component supply is not expected to create much employment, especially in Scotland – a local supply chain will take a long time to be created.⁹

Waste management

The industry ranges from small, local SMEs to multinationals. Multinational waste management companies will continue to grow across Europe, including in the UK where companies from EU countries (such as France and Germany which have longer histories of recycling and technology development) are strong. Examples of large, dominant companies include UK Waste, Onyx (French), SITA (French), European Metals Recycling Ltd, RWE (Germany) and Schaffer Bins (Germany). The smaller waste management technology providers focus on niche markets, such as waste shredders, bins, sorting equipment and vehicles.

There are opportunities for diversification from other sectors such as engineering industry, metal fabrication and plastic product manufacture.

⁸ Renewable Supply Chain Gap Analysis (Summary Report), DTI, January 2004

⁹ The Renewable Electricity Business in Scotland, Scottish Enterprise, February 2001

Cleaner technologies

Electronics is a major manufacturing industry in Scotland, with particular strength in systems for automotive, telecommunications, medical and defence end user markets. The offshore oil and gas industry in Scotland ensures the presence of major chemical refineries, which in turn promotes industries such as plastic packaging.

CTP clearly provides opportunities for a vast range of suppliers, from environmental consultancy to process automation and management training to product design. Although CTP specialists are likely to develop in the future, current suppliers provide solutions as part of their standard product offering, mostly undertaken by the process control, process engineering and automation specialists. Many of these companies do not see themselves as providing environmental technologies even though many have developed CTP expertise.

Scotland capability summary

The following table shows the typical elements of supply chains for renewable marine energy, clean technologies and waste management, along with Scotland’s current capability strengths in these areas.

Materials	Components	Equipment	Systems	Services	Implementers
composites	blades	turbine blades	turbine systems	foundation / installation services	developers
metals	fasteners	pitch controls	control systems	electrical eng.	turnkey contractors
concrete	instruments	bearings	wave generators	mechanical eng.	operators
coatings	transmission components	mechanical transmissions	electrical / electronic systems	construction	
rubber	metal fabrications	rotor shafts	braking	installation	
plastics	cables	generator devices	storage	maintenance	
glass	Instrument parts	nubs	materials separation	inspection	
	pipework	instruments	materials handling	energy management	
	valves	floating	emissions control	systems integration	
	pumps	separators	energy efficiency	environmental monitoring	
	compressors	conveyors	process control	consultancy	
	electronic sensors	insulation		waste treatment	
	seals/gaskets			waste collection	
	mouldings				
	machined parts				
	castings/forgings				

Key: high capability medium capability low capability

Limited information exists in the public domain on the core capabilities and competencies existing in sector and sub-sector of marine energy, clean technologies and waste management. It should also be noted that many of the companies along the core supply chains may also supply, or have the potential to supply into the wider green economy. For the purposes of this review, Scotland's capability strengths were assessed in terms of the number of active companies supplying goods and services, where there is scope to expand into the three highlighted 'green' markets.

Opportunities

A broad range of opportunities for Scotland have been highlighted by governmental and private organisations. These are summarised by category below.

Renewable energy

Wind is forecast to be the major source of new renewable energy across the UK for the next 10 years, offering manufacturing opportunities in Scotland, particularly for components that are difficult to transport.

Scotland has substantial natural wave and tidal resources, along with the European Marine Renewable Energy Test Centre. Given sufficient support, there are significant national and global opportunities for manufacturing and service.

The forecast revival of the global hydro market will offer opportunities for both equipment and service supply.

Development of the UK fuel supply chain for biomass will provide opportunities for the agricultural and forestry industries and could lead to significant long term employment.

The UK is experienced with PV technology and there is potential for a strong and competitive industry, particularly within secondary manufacturing.

Waste management

Demand is increasing for a very wide range of technologies and services in areas such as recycling and composting technologies/services, materials reprocessing, recycling product design, energy from waste technologies, landfill gas systems, incineration equipment, waste

minimisation advice, waste policy studies, waste management vehicles, shredders and compactors.

Waste management is currently one of the least active areas for UK export development. Opportunities do exist, however, in developing countries thanks to the restructuring and privatisation of waste management operations. Landfill expertise and cost-effective waste management equipment will be in particular demand. Consultants already involved in export markets need to strengthen links with the UK waste management industry, alerting it to opportunities.

Cleaner technologies & processes

The provision of innovative technologies and services is key to exploiting CTP opportunities. Suggestions to support and facilitate this exploitation include:

- Encouraging foreign direct investment – providing technology, skills and expertise to address weaknesses in domestic supply chain and transferring proprietary knowledge and best practices to strengthen local capacity.
- Emphasising the importance of on-going training – recipients need support in the form of intensive training to ensure the technology is retained and progressed in the longer term and effectively diffused through the recipient's operation.
- Establishing 'users groups' – increasing suppliers and recipient communication to enable benefits to accrue from modifications and improvements

The establishment of a Cleaner Production Centre in Scotland would catalyse and mainstream cleaner technologies and processes. The centre would collect information, such as case studies, and disseminate it to interested parties and, through affiliated organisations, would provide training, applied research, technical assistance, regulatory assistance and possibly financial assistance.

Opportunities – alternative markets

Other opportunities in alternative markets that have been suggested for Scotland include:

- Development of internationally competitive forestry & fisheries industries.
- Promotion of sustainable building design & construction.
- Support the further development of the organic produce market.
- Development of the fuel supply chain (agriculture & forestry) to support the long term development of the biomass energy industry.
- Develop the photovoltaic industry to an internationally competitive level.

- Further grid development to cope with renewables.

Jobs growth potential

There is very limited international evidence on the impact of government interventions to create jobs in the environmental sectors . Assessment of jobs growth in Denmark, where there has been a large number of interventions, is limited to the wind industry, which now supports over 20,000 jobs. Spain has also invested to create a significant wind energy industry.

Any intervention would build on existing support for research, development and commercialisation of renewable energy and waste technologies. Scottish Universities have considerable expertise in these areas and Scottish Enterprise, along with industry support organisations, is already very active in market development.

Even though there are only a few companies in the market at present, jobs growth potential in wave and tidal energy is particularly strong. In the long term, given sufficient support, there is the potential to replicate Danish and Spanish success in creating employment in renewable energy.

Strategic options

Differing interventions have different impacts at the varying stages of market development. The following table shows examples of interventions that have been used to achieve the actions required at the relevant stages of market development for the five key technologies for Scotland.

	Stage of development	Action required	Intervention examples
Offshore wind	Emerging	Market growth stimulation	Skills development, technology transfer from existing markets, diversification / opportunity awareness programmes
Wave	Emerging & demonstration	Market & supply chain growth	Prototype demonstrations, supply chain development, diversification / opportunity awareness programmes
Tidal	Innovation & demonstration	Innovation stimulation	R&D support, innovation development, showcase demonstration projects
Waste management & recycling	Established	New market creation	New product development & promotion programmes
Clean technologies	Established / emerging	Awareness raising	Diversification /opportunity awareness programmes

Conclusions

Despite the pressure and suggestions from environmental groups such as Friends of the Earth and the WWF, which see the creation of 'green jobs' as an effective way of achieving sustainable development, few countries have specific policies designed to create and develop green employment. Most choose to intervene to meet international regulations or to stimulate the growth of specific environmental technology markets to help meet renewable energy or waste disposal targets.

Denmark is the major exception. It is the most advanced country in the world in terms of environmental regulation and sustainable technology development. It has recognised the opportunities for developing sustainable industries that can compete on a global scale and have gradually been developing green industrial development and green jobs strategies over the past 10 to 15 years. One result of this sustained activity is the domination of the global wind energy market and the creation of over 20,000 jobs supporting the industry.

Over the long term, Scotland has the opportunity to emulate Denmark's success in the wind industry by supporting its embryonic, but world-leading wave and tidal renewable energy industry. In the short to medium term, offshore wind, clean technologies and waste management & recycling also offer opportunities for jobs creation, building on existing capabilities and competencies. Jobs will be created in these high growth industries without intervention, but support will speed up this process and help Scotland to become internationally competitive.

Appendix A

Organisation-based green industrial policies

Canadian Labour Congress

The Canadian Labour Congress' Green Industrial Policy includes:

- New ways of measuring well-being, e.g. a Genuine Progress Indicator (GPI), which it deems is necessary to measure the success of a Green Industrial Policy;
- Programmes to require and encourage the use of renewable energy, such as solar, wind, wave and biomass;
- A national programme of energy efficiency in buildings, vehicles and appliances;
- Instituting new and extended mass transit systems;
- National waste reduction, recycling and remanufacturing schemes;
- A national government-sponsored programme, with incentives for green consumerism;
- Research programmes for sustainable production, including projects for green industrial parks, with the industries linked through, for example, waste utilisation, energy co-generation or community heating;
- A national investment programme for green infrastructure, such as clean water, sewage eco-treatment and transport;
- Enhancement and remediation of national, provincial and territorial parks;
- Green procurement programmes, e.g. government purchase of green energy, supplies, equipment and vehicles;
- Green labour market programmes for helping retrain, provide work experience and job placements for unemployed Canadians in work which contributes to achieving sustainability;
- Comprehensive eco-labelling and information programmes, e.g. organic food, pesticide and antibiotic content of food, energy labelling, recycled material content, toxic content, etc;
- All programmes involving expenditures for Green Industrial Policy to include Just Transition (support for workers made redundant) during environmental change.;
- A programme of green taxation;
- A programme of environmental regulation.

Friends of the Earth

Agriculture

Friends of the Earth suggestions include adopting a pesticide reduction target and encouraging the use of the least damaging and harmful pesticides. They also suggest introducing a nominal charge for chemical pesticides and fertilisers which would provide an incentive to reducing their use and would provide funds for information and advice schemes and grant-aid schemes for converting to organic or less chemically intensive systems. Their final recommendation is to make target funds available to provide skills for rural unemployed to work in farming and conservation.

Manufacturing

It suggests adopting a strategy that focuses on reducing waste, along with the following measures:

- a target for increasing the recycled content of newsprint to 80% by 2010;
- further increases in landfill tax, using an escalator similar for road fuel duty, with provisions to include incineration within the tax;
- a proportion of the revenue from the tax to be made available for local authorities to invest in recycling collection infrastructure that ensures that the jobs created in these activities are quality jobs;
- introduce an aggregates tax that provides a stimulus for increasing recycling of demolition waste and would increase employment in doing so – further employment gains could be made by using the revenue from the tax to reduce employers national insurance contributions;

Sustainable energy

It suggests that jobs can be created by strengthening CO₂ emission policies, with the emphasis on the provision of energy at the least social cost, rather than at the lowest possible price per unit of energy. This could include:

- a target of 10% electricity generation for renewable energy by 2010, driven by a change in the tax regime;
- the development of community heating schemes;
- programmes to install energy efficient measures - support the Home Energy Conservation act with more public finance and increase the use and understanding of comparable information on energy/eco-labelling;

- tighten the building regulations to save energy in new housing and broaden them to include building refurbishment;
- impose a duty on energy supply companies to ensure that energy saving measures are promoted by providing and promoting a loan scheme to customers.

Transport

It suggests expanding the provision of public transport and encourage people to use their cars less – measures that have been shown to create jobs, e.g. the Metro in Manchester.

- High targets for new housing provision (75%) within urban areas to reduce commuting from out-of-town developments;
- Reform of the tax system, including an introduction of a tax on private, non-residential parking to end the perk of free workplace parking;
- Install environmentally sustainable transport systems – shift the balance of spending on transport towards investments that will encourage bus & cycle use, and over the medium term to increase rail/light rail transport;
- Strengthen regulation in the rail and bus sectors to ensure they attract investment and expand – also to ensure that the operations of individual companies are co-ordinated to create efficient and comprehensive services.

Water

It suggests that jobs can be created by introducing policies to further the work of water companies in improving the water infrastructure and protecting the environment.

- Increase the targets for reducing water leakage;
- Invest in land management which protects habitats and wildlife, while enhancing the natural beauty of the environment – open this up for recreational purposes, with guidelines for walkers and school parties;
- Encourage water companies to take on staff for specific environmental projects, including skills training.

FEESE

Research carried out by FESE on the environmental industry in Germany, Sweden and Finland came up with very similar issues and recommendations for the three countries.

These are summarised below:

- The dissemination of information on matters such as environmental legislation, management, technologies and so on needs to be improved.
- There is a need to improve environmental awareness. For continuous development in companies in the environmental sector as well as for environmentally driven companies, the supply and update of information and education is key.

- There is a need to further develop statistics and initiate studies addressing driving forces and successful implementation of environmental issues.
- There is a need to generate greater support for environmental issues at Board level.
- There is a need to increase environmental awareness down the supply chain and in customers.
- There is a need for training in niche areas, particularly for SMEs to continuously improve both their own skills and competences – cheaper courses for SMEs should be available.
- Companies wishing to export their environmental products should have access to information about their target markets.
- There is a need for increased networking in the environment industry.
- Environmental issues need to become a part of the economic mainstream, through the integration of environmental issues into education, the economy and legislation.
- In-company training needs to be encouraged. Since training the workforce is essential to productivity and profitability, companies can and should take a more active role in employee education and training.
- Management should be trained in the use of sustainable production, so that this can be filtered through the workforce.
- Eco-tourism and other possibilities to add attraction-value to a region and its natural resources should be encouraged.

Appendix B

National green industrial policies

Denmark

The goals of the Green Business Strategy (1999 to 2002) were:

- To further the green competitiveness of Danish enterprises and develop the market for green products.
- To develop Denmark so that, in 2005, it is among the OECD countries with the most enterprises with environment certification (Denmark was number two in terms of companies per head in 1999).
- Dissemination of green and ecological labelling. This should maintain Denmark's position as one of the countries where environment and ecological certified products have the largest turnover.
- The Government must further resource effectiveness in all businesses.

Apart from the usual policy instruments for promoting sustainable development, measures from the strategy that relate directly to the development of jobs on sustainable industries were:

- Public grants and subsidy programmes for clean products, energy efficiency, renewable energy sources, etc.
- Innovation and incubation centres/science parks.
- Development contracts and enterprises (venture capital)
- Public incentives/support/institutional building for knowledge distribution (technological information, counselling and technological centres/certified service centres).

Denmark's Working Group on a Green Industrial Development Strategy produced a discussion document in 2001 which made a large number of policy recommendations that were considered when formulating the current environmental industrial policy. These include:

"Government policies, including environmental regulations, green taxes and public procurement, should be designed in such a way that their overall impact furthers the greening of industrial development by rewarding companies and consumers that make an effort for the environment by means of market-based incentives. It should be endeavoured

to design international regulations in such a way that green products and competencies become a powerful door opener in the global market.

Companies should have access to competencies, tools, environmental data and advice, which enable them to efficiently integrate environmental considerations into their strategies, development activities and day-to-day decisions. Competence development should be available to management and employees, enabling them to utilise environmental performance as an ingredient of competitiveness in the global as well as national markets.

Framework conditions should be developed that foster commercial exploitation of new environmental technologies. There is a need for effective involvement of the educational system, the research community, the financial sector, the environmental regulatory authorities, public procurement and the market. It requires the building up of new competencies and widespread will for change – in society as well as in companies”.

Sweden

Sweden’s key policies which will have an impact on employment in sustainable areas are outlined below, other than the Local Investment Programme, which is detailed in the body of the report.

Industry consultation

The Government is consulting and developing voluntary agreements with industry as a part of a ‘softer’ and longer-term approach to sustainable development. Initially, the government have focused on two sectors:

- The building sector, where environmental thinking and sustainability provide opportunities for the development of new technology, new building materials, system solutions for waste management and more efficient uses of energy, etc.
- The transport sector, which it sees as essential for sustainable development.

Public procurement

The Government has introduced targets for the public procurement of environmentally sustainable products. The Government spends 15% of GDP on public procurement and is making sustainability a key purchasing criteria.

The city of Göteborg holds training seminars and workshops on green purchasing, including legal requirements, specific tools, and best practices for green procurement. By 2000, 80 to 90 percent of municipal staff had been trained on green purchasing.

One of the aims of the green procurement policy is to create a wider market for green products. The Swedish government forecasts that its policy will significantly increase the volume of affordable, sustainable products available to the private sector.

Innovation and export support

The Government is investing SEK10m (£750,000) in financing the establishment of office facilities for, and special funding initiatives in, environmentally driven business development and environmental technology exports. The Government aims to strengthen the link between public and private sector with respect to research, technological development, commercialisation and internationalisation of Swedish environmental technology.

Networking

Networking between the environmental managers of major companies has been established in projects sponsored, at low cost, by the government.

The renewable energy programme

The Swedish government is investing approximately £625m in a long-term (10 to 15 year) programme of R&D and demonstration of renewable energy technology. The focus is on the development of biofuel fired CHP, biofuel supply and ash recycling, new processes for ethanol from forestry raw materials, alternative motor fuels, wind power, solar and energy efficiency in buildings, and the industry and transport sector.

Local Investment Programme

The aims of the local investment programmes are:

- reduce pollution load
- increase the efficient use of energy and other natural resources
- increase the use of renewable resources
- increase the re-use, recovery and recycling

- improve biological diversity
- safeguard cultural environmental values
- improve the functioning of natural plant nutrient cycles.

The major fields of activity in the 1998-2001 local investment programmes were:

- The development of a sustainable supply of energy (the substitution of fossil fuels and other unsustainable sources with renewables) and the efficient use of energy. Over one third of the investments goes to the energy sector.
- Making whole residential areas green (about 20 % of investments), i.e. reducing the use of energy and improving waste management and water treatment. This also makes areas more attractive to residents and raises the awareness of and commitment to the environment and sustainable development.
- The restoration of wetlands and improving local treatment of sewage and storm water, to reduce the pollution of fresh water and of coastal areas.
- The development of plants for biogas production from organic waste.
- The restoration of polluted soils in old industrial sites, the conservation of nature areas important for biological diversity, and in the greening of public transportation and freight.

Canada

Examples of 'green job' related activities by various Government departments under the banner of sustainable development are given below:

Enviroclub

Enviroclub is a partnership between Environment Canada, Export Development Canada, the National Research Council of Canada and the Climate Change Action Fund. The Enviroclub helps SMEs to improve profitability and performance through environmental performance. It has two components: in-plant pollution prevention measures and raising awareness of eco-efficiency.

Science Horizons Program

Environment Canada's Science Horizons Program is intended to match promising young scientists and university graduates with experienced scientists and program managers, to give them hands-on research experience working on environmental projects.

EnviroCareers and EnviroEntrepreneurs

EnviroCareers and EnviroEntrepreneurs were programmes aimed at school children, aged 15 and 18 respectively, providing encouragement, advice and support for a move into environmental employment. Details on the effectiveness of these schemes are not available.

Benchmarking

Comprehensive benchmarking support was provided to SMEs in the environmental sector, coupled with expert advice on how to improve performance and reach their 'full economic potential by...enabling them to select and target areas with the highest payoff in quality, productivity and customer satisfaction'.

Wales

Within the Welsh strategic plan, the priorities affecting the development of jobs in sustainable industries are to:

- Assist the shift towards environmentally friendly economic growth, by encouraging service and knowledge based businesses and encouraging best practice, including greater energy efficiency within industry.
- Pursue a course of developing Wales as a global showcase for clean energy production.
- Encourage the development of strong environmental goods, services and renewable industries sectors.
- Encourage sustainable farming through an increased emphasis on agri-environment measures and organic production.
- Intensify business and environment campaign activities.
- Develop a strategic framework for energy matters in Wales.
- Increase the emphasis on energy efficiency, use of clean energy, recycling, waste minimisation and better management of landfill sites.
- Support healthy lifestyles and green tourism by developing the National Cycle Network.
- To test all elements of the National Economic Development Strategy budget against the requirements of sustainable development.
- Use the purchasing of the public sector in Wales to promote the use of environmentally friendly goods and services.

'Learning to Work Differently' sets out policy commitments to help to deliver sustainable economic growth (primarily through WDA). Many of these have an indirect impact on jobs by increasing the energy efficiency and sustainability of businesses. Those with a direct impact on jobs include:

- We will encourage businesses to consider...the types of support they will need to meet future patterns of demand for products and services, as society moves towards a more sustainable growth pattern.
- We will promote the role of new technology in helping businesses in Wales move towards a more sustainable pattern of production, and provide active support to the development and implementation of new technology.
- The Agency will contribute to the aims of reducing greenhouse gas emissions and developing diverse supplies of energy in environmentally acceptable ways. In particular, we will actively promote the development and use of renewable energy in Wales.
- The Agency will...promote Wales as a sustainable location for inward investment, stressing the long term benefits of a commitment to a sustainable future.
- Through our established links with other countries we will develop markets for sustainable technologies and best practice, particularly to solve problems which impact on global sustainability.

Each of these commitments is supported by proposals for practical action.

UK

The UK government's sustainable consumption key objectives are as follows: greater resource efficiency; support business innovation and take-up of best practice in technology & management; producer responsibility for waste; government drive on sustainable procurement (including new forms of information to influence choice and purchasing behaviour).¹⁰

Its renewable energy key objectives are: remove market barriers and create a level playing field for renewable energy and energy efficiency; new technology development; technology demonstration; promote the widespread adoption of energy efficiency measures; and support low carbon programmes.¹¹

¹⁰ Sustainable Development Task Force, www.sustainable-development.gov.uk/taking-it-on/taskforce/10sus.htm

¹¹ Sustainable Development Task Force, <http://www.sustainable-development.gov.uk/eac-wssd/commitments2.htm>

European Union

The EU has identified sectors¹² where there is a positive link between environment and employment. They recommend that these sectors should be the focus of supportive policy measures at European, national and local level. These are detailed below.

- Manufacturing industry
 - investment in clean technologies to reduce the use of natural resources – cost savings result in increased competitiveness and maintain/create employment.
 - development and marketing of green products leads to new business opportunities and business expansion, with positive employment effects.
 -
- Transport
 - stimulation of transport options other than the car, through provision of improved infrastructure for public transport, cyclists, pedestrians and combination of transport modes.
 - research & development of cleaner technology options such as fuel cells.
 -
- Energy
 - improved energy conservation in private & public buildings
 - energy counselling for industry and private households
 - production and use of renewable energies
 -
- Agriculture
 - management and conservation of valuable natural assets
 - sustainable management of forests
 - development and use of new crops in the non-food sectors, such as for energy production from biomass
 - organic farming
 -
- Consumer behaviour
 - an important stimulus for more sustainable production.

12 <http://europa.eu.int/comm/environment/eussd/>; <http://www.nssd.net/>

Appendix C

Denmark's green industrial development

Timeline 1990 +

Early 90s Green procurement policy for public institutions – regulation, information and guidelines on procurement. Ongoing, with bureaucracy reducing goals.

1993 - 1997 Danish environmental policies based on detailed regulation and control, with strict target setting. Environmental policies are not linked to any great extent with industrial policies.

1993 Wind turbine obligations – utilities pay high rate (85% of consumer price) for electricity from wind, plus subsidies, plus CO2 tax rebate.

1993 Biomass agreement – set target for 10% electricity consumption from biomass by 2000 (extended to 2005).

1994 Green taxes, including energy & transport taxes – positive results in terms of emissions, industry behaviour and technological development. Continually revised. €10bn revenue in 2000.

1996 Energy21 policy – set target for 20% consumption from renewables by 2003.

1996 Electricity Act, supporting the development of all renewable energy technologies – utilities forced to give priority access to RE and pay 85% of consumer price. Utilities set target of 1,500MW from wind turbines by 2005 (met end 2000, with 2,100MW installed). Target of 50% of primary energy use from renewables (79% of electricity) set for 2030.

1996-7 Number of Government 'Executive Orders' – provide subsidies of 15 to 30% of the construction costs for renewable energy equipment.

1997 - 1999 Introduction of policies to support the research and development of new products and processes, and the uptake of these by Danish enterprises. Development of a Green Jobs concept.

1997 Programme for clean technologies, targeting SMEs – focus on new processes till 2000, then new products 2000-2004. Subsidies for development projects, green labelling and life-cycle analysis & method development. €35m for 2000 to 2004 phase.

1997 Action plan for ecological reorientation of buildings – subsidies for the development of products and processes. €10m for 2000 to 2004 phase.

1998 Green Jobs Fund – financial support (subsidies) for the creation of new jobs concerning environmental protection, including in product and process design & development. €4m a year for 1998 to 2001. 1,000 permanent jobs created.

1998 Energy research programme – grants and subsidies for the R&D of new and future (green) energy sources. €90m from 1998 to 2003.

1998 Electricity production support scheme – grants (per unit produced) for electricity production from renewables, bio materials and natural gas. €720m from 1998 to 2003 – scaled down and only for gas from 2000.

1999 Electricity Reform Act – RE subsidies transformed and introduction of green certificates.

1999 Programme to support energy efficient enterprises – aims to encourage the design, development and use of new methods & processes. €250m for 1999-2003.

1999 - 2002 Sustainability becomes a driving force in Denmark's industrial policy. Dialogue with more than 300 CEOs from private enterprises, representatives from interest organisations and directors from research institutes. This led to the development of the Government's 'Green Business Strategy' which aims to integrate growth, innovation & sustainability. It has shifted policy away from detailed regulation & control to promoting environmental protection through technological innovation.

2000 Technology fund – grants for development of clean-up and prevention methods. €2m a year for 2000 to 2004.

2000 Support for the development of new ecological agriculture/fishery production methods. €150m from 2000 to 2003.

2000 Support for the development of sustainable agriculture/fishery processing methods. €70m from 2000 to 2003.

2000 Support for the development of enviro-friendly agriculture. €35m from 2000 to 2003.

2000 Support for product development, market introduction and promotion of new sustainable products in forestry. €3m in 2000.

2000 Strengthening innovation in industry – central & local government capital provision for institution building, knowledge diffusion, project support in early development & marketing phases. Focus on energy efficiency and environment improving technologies & processes. €420m from 2000 to 2003.

2000 Support to strengthen environmental competencies and technological developments in industrial production. €35m from 2000-2003.

2000 Programme on environmentally friendly transport technology – support for pilot & demonstration projects and R&D. €5.5m from 2000 to 2002.

2001 Reduction in most forms of wind turbine support plus incentives to replace wind turbines that are 10+ years old with newer, larger and more efficient turbines.

2002 New government, in which the Greens are no longer a majority, cuts environment spending significantly. Renewables development funds, state aid for several large wind energy projects and green jobs fund cut. Focus on the use of cost benefit analysis reduces focus on long term development projects.

2003 Environmental policy further integrated with the green industrial policy. The policy now has the central guiding principals of 'achieving cost effective solutions and the increased use of market-based instruments'. Requirements and standards for emissions and technologies are not now seen necessarily being the most effective way of achieving environmental goals. Increased use of international partnerships for new product development.

Appendix D

Green jobs definitions

Canadian Labour Congress

The CLC bases its recommendations on its own definition of 'green jobs' which, as with most countries, focused on the wider issue of sustainable development.

"Green jobs are jobs in a sustainable economy. Sustainable industrial activities are those which utilise environmental resources without using them up and without producing overwhelming amounts of pollution and waste".

Their various categories and subcategories of green job are as follows:

- Jobs which reduce our impact on the environment
 - Cleaning up contaminated soils & water sources
 - Installing water conservation devices
 - Collecting and processing organic waste
 - Collecting and recycling materials & products
 - Retrofitting buildings to make them more energy efficient
 - Installing and operating systems which eliminate the use of toxic substances
- Jobs which protect and restore damaged ecosystems
 - Protecting and restoring land/rivers/sea, etc.
 - Reintroducing and protecting native plants and endangered animal species
 - Maintaining parks and creating new green spaces & green corridors in urban landscapes.
- Jobs which produce and disseminate the information we need to become more sustainable.
 - Investigation, monitoring and research.
- Jobs in the sustainable production of necessary goods & services (using low/positive environmental impact materials)
 - Farming

- Food processing
- Construction
- Transport
- Renewable energy
- Jobs producing alternative or substitute products which reduce the environmental impact of existing products
 - Production of gas/electric hybrid cars to replace existing fossil fuel cars
 - Production of ethanol to replace petrol
 - Natural sewage treatment instead of high-energy chemical processing
 - Remanufacturing electronic goods
 - Environmental engineering for cleaner production
 - Manufacture of solar panels & windmills
 - Construction of mass transit systems
 - Energy retrofitting of all types of building

WWF

The WWF has a strong interest in the development of 'green jobs', including WWF Scotland. The WWF uses the following guidelines for the development of 'green jobs':

"[Government should] ensure that all economic activity maintains and enhances the natural capital and secures the long term economic future. The ultimate aim is to create goods and services in ways that protect or enhance the natural environment, safeguard jobs and communities and contribute to a good quality of life for all. In other words, create a sustainable economy. This should be done through progressively 'greening' the economy through improvements in resource efficiency and the use of new, clean technologies. This improves the performance of business and creates major new business and employment opportunities."

They specify three main categories of 'green' economic activities:

- Public and not-for-profit activities aimed at environmental enhancement
 - Waste collection
 - Water treatment

- Planning & advisory services
- Repairing & enhancing the environment
- Environmental education
- Commercial activities providing environmental goods and services
 - Environmental technology manufacturers (both aimed at cleaner production in the future and cleaning up past environmental damage)
 - Private sector waste management
 - Renewable energy suppliers
 - Consultants
 - Environmental improvement services, incl. urban regeneration, remediation & landscaping
- Activities improving the environmental performance of non-environmental sectors.
 - Actions to address the negative environmental impacts of existing parts of the economy.
 - Actions to improve environmental performance, such as the introduction of organic farming.

FEESE

in Germany, Finland and Sweden.

It breaks down employment in environmental markets as follows¹³:

- Remediation of sites
- Pollution control measurements
- Environmental impact assessment
- Clean technologies
- Environmental management (including eco-auditing & eco-balance)
- Sustainable production and design
- Waste management (solid/liquid), monitoring, treatment of hazardous wastes
- Recycling technologies
- Environmental communication, education and training (including the information society)

¹³ <http://www.projekte.org/feese/>

This is further broken down in the following diagram, which shows all of the categories FEESE considers to entail 'green jobs'.

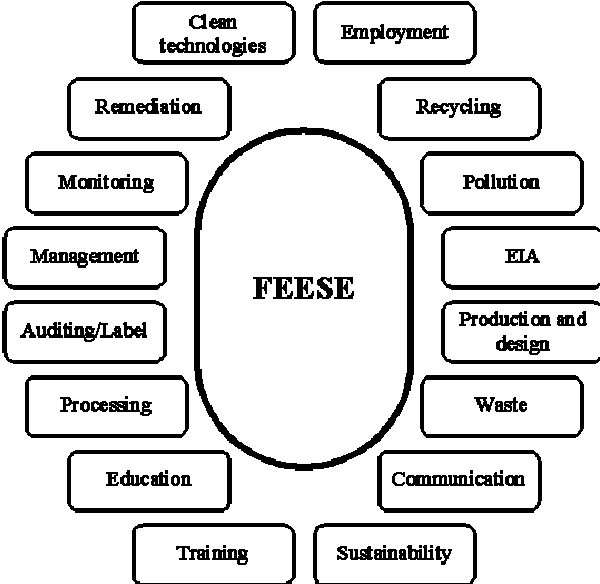


Figure 1. The FEESE green job categories

Appendix E

Key technology markets overview - renewable energy

Overview

The renewable energy sector covers the supply of technologies and services for the generation, collection or transmission of energy from renewable sources such as biomass, solar, photovoltaic, wind, tidal and geothermal sources. It includes the manufacture of equipment, design, construction, installation, management and operation of RE facilities. Approximately 1,500 jobs were sustained by the industry in Scotland in 2003, 22% of the UK total.

Hydro power currently makes up the bulk of Scotland's current renewable resource, providing 11% of Scotland's electricity.

Future market

The UK market for renewable energy was approximately £290m in 2002, with £80m attributed to Scotland, and forecast to grow at average of 12% per annum to 2010.

In Scotland, strong growth is forecast in wind projects as well as wave and tidal research. As biomass, solar and hydro have struggled due to regulation and lack of support, energy from wind is set to make up the bulk of new renewables capacity until 2010. Scotland is forecast to take a 39% share of the UK onshore wind power market by 2010, with significant growth in offshore wind.

Market drivers

Political

Much of the renewables market development worldwide is reliant on legislation and government subsidies. This is likely to continue until costs fall into line with fossil fuel sources of energy.

Within the UK, the market is driven by the Government's target to increase electricity derived from renewables to 10% by 2010, under the European Union's Renewables

Directive.. The Scottish Executive has set a target of 18% of Scotland's electricity supply coming from renewables by 2010 and 40% by 2020. Scottish Renewables is particularly active in promoting the development of the renewable energy sector in Scotland.

There is seen to be good government support at the research and development stage, but no structured programme to take technologies to pre-commercialisation and commercialisation.

There is a shortfall of funding for renewables in the UK as a whole, compared to other European countries, some of which use funding to encourage relocation and inward investment. This, along with a clear, ongoing commitment to renewables development, is crucial to encourage commercial investment.

Economic

The UK's renewable energy sector is small compared to Continental European countries such as Denmark and Germany, where the domestic markets are more advanced. European manufacturers are establishing manufacturing facilities in the UK. Scotland is reliant on large multinational or foreign owned companies to bring expertise and investment in the wind industry.

UK suppliers such as Bronzeoak, Gilbert Gilkes & Gordon, Thermomax and Talbott's are active in the global market, but the number is small compared to the Danish, French and German presence. The DTI's Renewable Energy Gap Analysis (2004) highlights the UK's strengths and weaknesses by sector.

Social

There is very little demand for higher priced 'green' energy. Where consumers shop around for electricity, choice is mostly based on price.

Expertise and skills that have been developed in offshore oil and gas technology (particularly high performance engineering, modular construction and offshore expertise) can be applied to renewable energy.

There is less resistance to the siting of onshore wind farms in Scotland than in most of the UK as there is a lower population density.

Technological

Scotland is leading the world in the development of marine renewables, being led by Scottish companies such as Ocean Power Delivery and Wavegen and by experts at Robert Gordon University and the University of Edinburgh. The European Marine Renewable Test Centre, based off Orkney, will soon test a 750 kW pre-production production prototype from Ocean Power Delivery. According to a DTI report, 'no major technical barriers to the development of wave energy prototypes have been identified'. Wave and tidal technologies need support, however, to move them from pre-commercialisation to market deployment.

Biomass is not well developed at a large scale, leading to uncertainty on future costs and hesitancy to commit on the part of growers and plant developers. Biomass is potentially economic if crop yields can be improved by 30%, but reliable fuel chains need to be established.

Continuing R&D in solar PV is required to make it an economic technology under UK conditions. International collaboration is required so that Scotland does not lose out to countries with established domestic markets for PV, such as Germany and Spain. Robert Gordon University is researching photoelectrodes for solar energy conversion.

International activity

A decade of funding and support has made Denmark a leading country in the field of renewable energy and the world leader in wind energy. It's focus has recently changed from large scale investment to achieving cost effective solutions by using market based instruments to direct more focused funding. To spread the cost of new product development, it is also increasing its use of international partnerships.

Following the pattern set by Denmark in the creation of a domestic market for wind power, other European countries are developing support mechanisms for wave and tidal power. Portugal has allocated 23 eurocents per kWh for the first 20MW of wave power constructed – equivalent to a grant of £6m per year. Ireland is considering a similar scheme. This will both stimulate local manufacturers encourage foreign wave and tidal power companies to relocate.

Opportunities

Wind is forecast to be the major source of new renewable energy across the UK for the next 10 years, offering manufacturing opportunities in Scotland, particularly for components that are difficult to transport.

Scotland has substantial natural wave and tidal resources, along with the European Marine Renewable Energy Test Centre. Given sufficient support, there are significant national and global opportunities for manufacturing and service.

The forecast revival of the global hydro market will offer opportunities for both equipment and service supply.

Development of the UK fuel supply chain for biomass will provide opportunities for the agricultural and forestry industries and could lead to significant long term employment.

The UK is experienced with PV technology and there is potential for a strong and competitive industry, particularly within secondary manufacturing.

Key challenges facing the industry

Competition from countries with greater levels of government support is the major threat. The growing wind market is being served by wind turbine suppliers with overseas manufacturing. European competition in PV manufacture is strong, and will be even stronger if European domestic markets decline and established manufacturers look overseas. Commercial wave technology is being developed more rapidly elsewhere, due to more supportive government policies.

Government funding is complex, with a large number of schemes administered by a range of bodies over the different stages of innovation and technologies. With the present funding structure, it is difficult to moving renewable technologies from the demonstration to the pre-commercial stage and from pre-commercial to supported commercial stage.

Outside of Government, major manufacturers and the UK finance industry are reluctant to become major players in the Scottish renewables market, due to concerns about stability in the energy market and about the long term viability of ROC/ROS (Renewable Obligation

Certificate / Scotland) prices. This, coupled with low confidence in biomass project performance, is restricting the development of a fuel supply, particularly energy crops.

There is a lack of local based suppliers for small scale technologies such as small wind, micro hydro, solar heating and biomass.

The grid needs to be upgraded to enable it to cope with intermittent electricity supply from renewable sources.

Scotland capability fit

According to the DTI's gap analysis of 2003, 240 companies were active in Scotland in the production, development and export of existing and emerging renewable energy technologies. These provide 1,540 jobs.

Approximately 150 these companies are involved in wind energy, providing around 1,180 jobs (approx 77% of total renewable energy jobs) – 550 in development, 610 in construction and 20 operational.

According to research conducted by Scottish Enterprise in 2001, of the 116 companies involved in renewable electricity in Scotland at that time, 17 were manufacturers (8 in wind) and 51 were developers.

The Vestas manufacturing wind turbine facility at Campbeltown currently employs 150 people. Component supply is not expected to create much employment, especially in Scotland – a local supply chain will take a long time to be created.

Key technology markets overview - waste management

Overview

The waste management sector covers the supply of products and services for waste collection, treatment, disposal, minimisation and recycling. With 72,000 employees, it is the largest environmental sector in the UK.

Future market

The UK market for waste management was £4.6bn in 2000 and forecast to grow to £9bn in 2010. By 2020, Scotland is forecast to produce 4.6m tonnes of municipal waste, an additional 1.4m tonnes per annum compared to 2002. Scotland's target is to move away from the 91% reliance on landfill in 2002, to 31% landfill, with 69% recycling/composting/conversion to energy in 2020.

Market drivers

Political

Regulations are forcing the rapid development of increasingly sophisticated waste management technologies and services in the UK.

The EU Landfill Directive is driving a reduction in municipal waste going to landfill, primarily by increasing the recovery, recycling and/or composting of waste. The EU Waste Water Treatment Directive is leading to the development of alternative sludge disposal strategies such as use as a fertiliser and incineration. The Aggregates Tax and a significant increase in the Landfill Tax are driving waste minimisation, reuse and recycling.

Additional regulations will drive the development of recycling the recycling industry. These include the EU End-of-Life Vehicles Directive (2007), the Packaging Waste Regulations and the Waste Electrical and Electronic Equipment Directive (2006).

Economic

Legislation is driving substantial growth in the UK market of 7% per annum. There is also considerable growth throughout Europe and in 2nd & 3rd World countries.

Government in the UK plays a relatively small role in waste management compared to most European countries. As a consequence, the market is more competitive and less protected. International companies are competing in and buying into the UK market.

Technological

Integrated forms of waste management, treatment and disposal are growing and becoming more sophisticated.

The UK perceived to be weak compared to European and US competitors in key areas such as recycling and incineration technologies.

International activity

Denmark, as with many environmental technologies, is a world leader in waste management policy development. The Danish government has recently issued the "Waste Strategy 2005-08", which contains over 100 initiatives for waste. The focus of the strategy is to prevent the loss of resources and environmental impacts from waste. It provides a number of new waste indicators to show the loss of resources and the landfill requirements for 22 waste materials. These indicators will help prioritise efforts in the waste area and will indicate the type of waste treatment that leads to the lowest resources loss.

Global players are emerging in the waste management market, many expanding through overseas acquisition. While UK companies are focused on opportunities in the domestic market, foreign competitors are active in developing markets outside of Europe.

Opportunities

Demand is increasing for a very wide range of technologies and services in areas such as recycling and composting technologies/services, materials reprocessing, recycling product design, energy from waste technologies, landfill gas systems, incineration equipment, waste minimisation advice, waste policy studies, waste management vehicles, shredders and compactors.

Waste management is currently one of the least active areas for UK export development. Opportunities do exist, however, in developing countries thanks to the restructuring and privatisation of waste management operations. Landfill expertise and cost-effective waste

management equipment will be in particular demand. Consultants already involved in export markets need to strengthen links with the UK waste management industry, alerting it to opportunities.

Key challenges facing the industry

EU Directives and related UK legislation require substantial investment in infrastructure and technology. To meet the targets, Scotland will require £700m¹⁴ of capital expenditure for new infrastructure for municipal waste. Planning authorities will need to understand the need for new facilities for waste recovery and treatment.

Markets for recovered materials need to be created and/or expanded, providing business development opportunities and support for recycling initiatives.

The industry needs to look at opportunities outside of the UK, so as not to lose out to large French, German and US companies who are establishing a strong presence in overseas markets. The rising foreign ownership of UK waste management operators may make this difficult.

Supply chain & Scotland capability fit

The industry ranges from small, local SMEs to multinationals. Multinational waste management companies will continue to grow across Europe, including in the UK where companies from EU countries (such as France and Germany which have longer histories of recycling and technology development) are strong. Examples of large, dominant companies include UK Waste, Onyx (French), SITA (French), European Metals Recycling Ltd, RWE (Germany) and Schaffer Bins (Germany).

The smaller waste management technology providers focus on niche markets, such as waste shredders, bins, sorting equipment and vehicles.

Opportunities for diversification from other sectors such as engineering industry, metal fabrication and plastic product manufacture.

¹⁴ The National Waste Plan 2003, SEPA/Scottish Executive

Key technology markets overview - clean technologies & processes

Overview

Cleaner Technologies and Processes (CTP) aim to minimise waste at source by adopting integrated pollution control in place of end-of-pipe techniques. The JEMU definition of CTP is as follows:

The supply of equipment and expertise for the cleaner, more resource efficient technologies, processes or products, which for example, decrease material inputs, reduce energy consumption, recover valuable by-products, reduce emissions or minimise waste disposal problems.

CTP encompass a range of disciplines including aspects of product design, materials technology, process engineering and process control.

Future market

As a relatively new environmental technology market, the CTP market is currently small. The global CTP market in 2000 was estimated at \$5 billion. North America and Western Europe are the largest regional markets with \$1.9 billion and \$1.8 billion respectively.

The market is forecast to grow massively through to 2010. The Joint Environmental Markets Units (JEMU) predicts a \$26.2 billion global market in 2010, growing at a compounded annual growth rate of 18%.

Although the deployment of CTP in the UK lags behind many other developed countries, there are signs that industry is beginning to switch from end of pipe solutions to integrated pollution control. A government survey of environmental expenditure by UK industry showed an almost doubling of integrated pollution control capital expenditure from 1997 to 1999, accompanied by a fall in end of pipe solutions.

Market Drivers

Political

Strict enforcement of environmental regulations to improve industrial environmental management and pollution prevention measures is the key driver for cleaner technologies and process. The UK market is particularly driven by the:

- IPPC (Integrated Pollution, Prevention & Control) regulations
- Landfill tax
- Climate change levy
- Air quality regulations
- Packaging regulations
- Draft EC ELV (End of Life Vehicle) and WEEE (Waste Electrical & Electronic Equipment) Directives

According to JEMU, future EC and UK policy and regulations are expected to drive the CTP market for manufacturing processes such as electrical goods, batteries, vehicles, packaging, paper and chemicals.

As part of Scotland's National Waste Plan, tools and initiatives are being developed to provide incentives to non-municipal waste producers to minimise wastes by incorporating cleaner process and technologies. The National Waste Plan establishes the direction of the Scottish Executive's policies for sustainable waste management to 2020. These initiatives will make waste producers more aware of the potential economic benefits of waste prevention, minimisation and sustainable waste management.

Economic

In the more mature environmental markets, in regions that have environmental infrastructure securely in place, such as North America, Western Europe and Japan, fiscal and economic incentives are the main drivers for the development of integrated CTP.

The uptake of CTP is fundamentally dependent on their ability to reduce operating costs. Uptake of cleaner technologies will only occur if environmental advantages can be translated into cost savings. The box below provides an example of how cleaner technologies (efficient process control) can provide economic advantages to recipient organisations:

BP's Grangemouth Utilities and Ethylene plants deliver cost savings, increased plant throughput and improved environmental status by implementing an efficiency-increasing digital plant architecture developed by Emerson Process Management.

The BP petrochemical facility at Grangemouth, Scotland, reported an annual saving of \$2.5 million by using AMS Suite: Real-time Optimizer. This includes energy saving from utilities optimisation and a 4% increase in plant throughput from the KG Ethylene optimisation application. According to BP the optimiser has been instrumental in reducing energy costs, a strategic goal for the site, saving approximately \$1.5 million per annum and reducing CO2 emission by up to 25 kilotonnes.

Emerson Process Management has formed a close working relationship with BP over the last 10 years. Its AMS Suite is an integrated family of applications for predictive maintenance, performance monitoring and economic optimisation. The technology enables companies to improve availability, plant throughout and product quality, while reducing operations, maintenance and utility costs.

Opportunities

The provision of innovative technologies and services is key to exploiting CTP opportunities. Suggestions to support and facilitate this exploitation include:

- Encouraging foreign direct investment – providing technology, skills and expertise to address weaknesses in domestic supply chain and transferring proprietary knowledge and best practices to strengthen local capacity.
- Emphasising the importance of on-going training – recipients need support in the form of intensive training to ensure the technology is retained and progressed in the longer term and effectively diffused through the recipient's operation.
- Establishing 'users groups' – increasing suppliers and recipient communication to enable benefits to accrue from modifications and improvements

The establishment of a Cleaner Production Centre in Scotland would catalyse and mainstream cleaner technologies and processes. The centre would collect information, such as case studies, and disseminate it to interested parties and, through affiliated organisations, would provide training, applied research, technical assistance, regulatory assistance and possibly financial assistance.

Key challenges facing industry

This is a new industry and the high cost of new technologies is inhibiting take up. There is also a lack of awareness in industry of techniques that have been developed and a lack of education and training on their use.

Supply chain

As an area of substantial future growth, CTP offers significant domestic and overseas opportunities for Scottish companies. Suppliers with particular expertise in areas such as materials, cleaner design, efficient process control and automation are well placed to exploit CTP market opportunities.

Scotland capability fit

Electronics is a major manufacturing industry in Scotland, with particular strength in systems for automotive, telecommunications, medical and defence end user markets. The offshore oil and gas industry in Scotland ensures the presence of major chemical refineries, which in turn promotes industries such as plastic packaging.

CTP clearly provides opportunities for a vast range of suppliers, from environmental consultancy to process automation and management training to product design. Although CTP specialists are likely to develop in the future, current suppliers provide solutions as part of their standard product offering, mostly undertaken by the process control, process engineering and automation specialists. Many of these companies do not see themselves as providing environmental technologies / services even though many have developed CTP expertise.

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