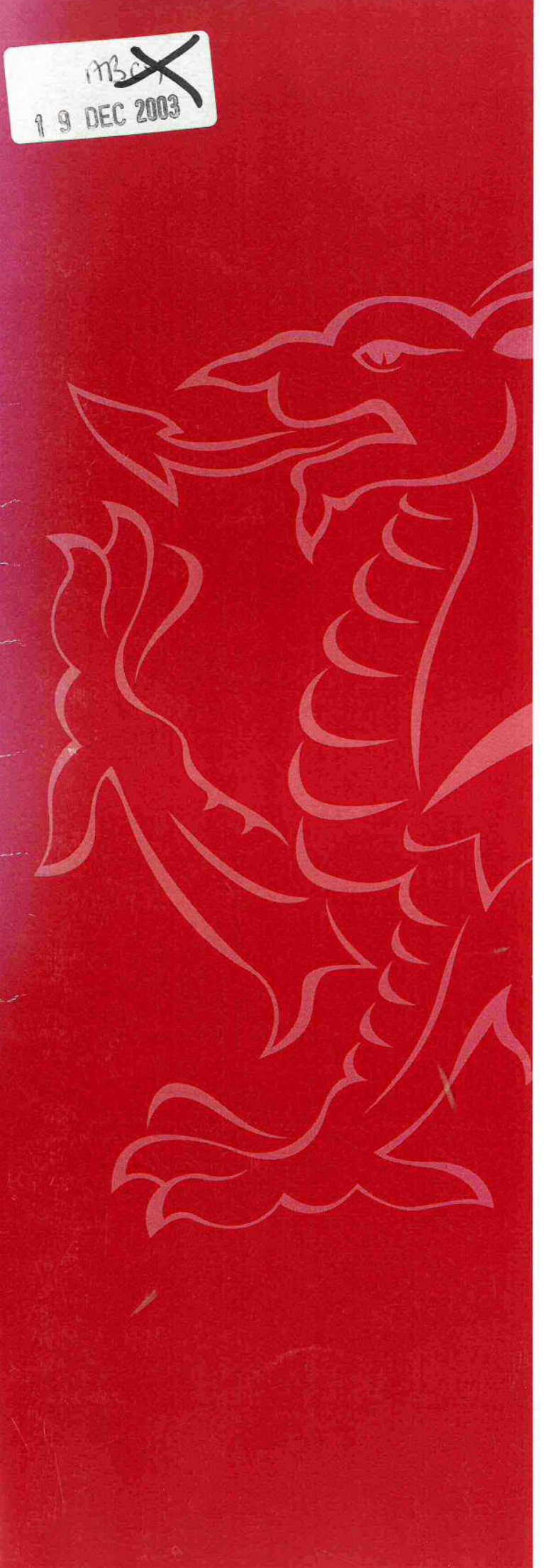

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Contents

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WERU Conference

In May 2003, the Welsh Economy Research Unit held its 11th annual conference. The conference theme was *Sustainable Development in Wales: Theory, Practice and Measurement*. Following the conference, speakers were invited to provide a summary of their presentations for this *Review*. Those received are published below. A wide range of issues was debated during the conference, and WERU would like to thank all conference speakers and delegates for their participation. Thanks are also due to Professor Ken Peattie of BRASS (ESRC Centre for Business Relationships, Accountability, Sustainability and Society), for his chairmanship throughout the day. Finally, WERU are extremely grateful to Sustainable Regions for their sponsorship of the conference.

Wales Today.

Max Munday, Welsh Economy Research Unit.

In order to provide a context for the papers that follow, this summary reviews the current state of the Welsh economy and outlines expectations of short term progress. Finally some comments are made relating to how economic progress in Wales is assessed.

The Welsh Economy faces a number of challenges. Both 2001 and 2002 were particularly poor years for regional manufacturing. By 2003 manufacturing production in Wales had reached a level some 12% below that of 1995. Larger employing sectors such as basic metals and metal manufacturing and electrical and electronic engineering saw output levels falling significantly in the period 2000-2003. Some sectors have done rather better, for example, food and drink and transport equipment experienced stronger output increases during the period 2002-03. A number of recent business surveys have reported falling order books, lower export expectations, and lower expected investment. Poor news in surveys has been further borne out by recently published export figures (HMCE, 2003). These showed that exports from Wales fell during 2002, albeit with some limited recovery in the first half of 2003.

Manufacturing employed around 180,000 people in Wales in 2002, or just over 17% of total employment. It is expected that some 20-30,000 jobs will be lost in Welsh manufacturing in the run-up to 2010. Currently, the sector contributes an estimated 23% of Welsh gross value added (GVA); this share is expected to fall to below 20% by 2010.

Manufacturing jobs in Wales are relatively well paid, and job losses are difficult to replace with employment of similar quality. Unfortunately these job losses have occurred at a time when it has become increasingly difficult to attract new foreign investment. While recent performance in attracting inward investment has been fairly good (see Table 1), this needs to be balanced against losses in the foreign-owned textiles, electronics and automotive sectors which have moved production facilities to areas such as Central and Eastern Europe (CEE). For the UK as a whole foreign inward investment fell from $130bn in 2000 to just under $25bn in 2002 (UNCTAD, 2003). The expected entry of CEE countries into the EU will undoubtedly make the job of marketing Wales abroad to prospective inward investors even more difficult. Already countries such as Czech Republic and Slovakia are seeing rapid increases in FDI.

Gloom in Welsh manufacturing has been compensated by the resilience of the services sector. Employment in services has increased, led by growth in retail and distribution, transport and communications, other business services and education and health. Key factors in the growth of services employment have been sustained increases in consumer spending, and the stronger financial commitments to the non-market sectors made by national and regional government.

Unemployment rates in Wales are at historically low levels, albeit with sub-regional disparities remaining important. For example, male unemployment rates in Anglesey and Blaenau Gwent are well above the Welsh average.

What can we expect for the Welsh economy in the period to 2010? Growth prospects will be influenced by the strength of the UK and global economies, and the effectiveness of European Union (EU) structural funding. However, the following may be expected:

- the Welsh economy growing but at a slower rate than the UK average.
- Welsh GVA per capita remaining around 80% of the GB average.
- employment growth remaining strong in elements of the non-market sector and in some private sectors, however
- in some of these market sectors of the economy the pay gap with the UK average will tend to be larger.
- areas of financial and business services remaining vulnerable to trends in globalisation, restructuring and rationalisation, and
- few parts of Welsh manufacturing seeing consistent growth of output or employment.

Assessing Progress

The National Assembly has set out ambitious employment and gross value added targets in its National Economic Development Strategy (NEDS). Indeed these have been linked through to the core targets of the EU structural funding programme. A principal target is for Welsh GVA/capita to reach 90% of the UK average by 2010. However, a number of well-rehearsed arguments show that this target is unlikely to be met, among these are the issues of structural changes outlined above.

In addition, and given the theme of the conference there are other issues relating to the economic development

Table 1: Foreign Direct Investment to Wales, 2000/01 -2002/03

Year	Projects	New jobs	Safeguarded	Total
2002/03	108	6,275	6,535	12,810
2001/02	93	5,469	4,248	9,717
2000/01	34	4,257	1,808	6,065

Source: Welsh Development Agency.

targets. For example, the measures of progress adopted, such as GVA ignore activity outside the market process, ignore externalities created in production, and ignore the distribution of wealth in the economy. Then important questions relate to the extent to which meeting GVA targets involves activity that is sustainable, and the potential environmental and social consequences of meeting these targets.

In line with its legal duty under the Government of Wales Act to promote sustainable development, the Welsh Assembly Government has started the process of reporting on a wider set of indicators that can be linked to questions of economic, environmental and social sustainability. The headline sustainability indices adopted to date comprise indicators of employment activity, educational attainment, crime rates, housing (unfit dwellings), climate change (greenhouse gas emissions), air and water quality, wildlife population, waste recycled, Welsh language, electricity production from renewables, and ecological footprint values (see Table 2). Then, the Welsh Assembly headline indicators comprise a very diverse mix of statistics.

Whilst these monitoring indicators are useful and represent an incremental step, a number of difficulties arise from their mixed units of account. Further, it raises the question, what does sustainable development mean in the context of each of the indicators? For example, is rapid employment growth good or a bad? Moreover, and with the exception of the ecological footprint, the indicators cannot deliver an overall picture of sustainability and welfare trends in Wales, and it is difficult to link these indicators to the more general sustainable development objectives of the Welsh Assembly Government (see www.wales.gov.uk).

In conclusion, the tools and measures currently used by the Assembly and its agencies to assess progress towards sustainable development objectives give no clear and consistent picture on the extent to which the Welsh economy is developing in a sustainable way.

Sustainable Development and Business: managing the pain, maximising the gain.

Rod Aspinwall, Special Advisor to Envios Group, Chairman of the Sustainable Development Forum.

Business has always had to conduct its affairs within the framework of the society in which it is located. This self evident truth is stated to position the comments that follow in the context of

Table 2: Welsh Assembly Government headline indicators

WAG headline indicator of SD – issue	Indicator description
Employment	% of people of working age in work
Education	% of people age 19 with NVQ level 2 or equivalent
Crime	Crime rates per 100,000 population:
	• Theft of or from vehicles • Burglary • Violent crime
Housing	% of unfit dwellings
Climate Change	Emissions of greenhouse gases (mt carbon equivalent)
Air Quality	Days when air pollution is moderate or high: Urban: • Cardiff • Swansea • Port Talbot Rural: • Aston Hill • Narberth
River water quality	% of river lengths of good or fair quality: • Chemical quality • Biological quality
Wildlife	% of widespread breeding bird species that have increased significantly since 1994
Waste	Household waste & amount recycled or composted (kg/person/year): • total household waste household waste recycled or composed
Welsh language	% of people who can speak Welsh: • aged 3 or over • children aged 3-14
Electricity from renewables	% of electricity produced in Wales generated from renewable sources
Ecological footprint	Wales's global ecological footprint in area units per person

businesses based within largely democratic societies, which have a level of legislative and regulatory control, and which are relatively transparent. So whereas business ethics and practices are moulded, modified and scrutinised in such societies, the reverse is true in lesser regulated societies having non existent or poorly developed democratic processes.

Hence, there is a significant challenge for trans-national corporations, operating across the globe, in both developed and developing societies when the notion of sustainable development is visited upon them.

Clear visions of what Sustainable Development (SD) means for societies, economies and the environment have now been achieved, and these are being articulated at the international, national, regional and local levels, and responsible businesses are now designing responses and reactions.

Sustainable development challenges us to change our behaviour. A near doubling of the global population during this century is now inevitable. This coupled with recognition of the destructiveness of man's historically resource-intensive development path, determines that we must now behave as long term tenants of the earth, not as passing vagrants.

Other challenges relate to how we view the relative importance of our economic, social and ecological systems. Creating and maintaining economies has dominated political leadership, so a fundamental challenge will be in shifting priorities to include an ecological valuation. Inherent in these challenges are a number of principles:

- Adopting a precautionary approach.
- Making the polluter pay.
- Valuing all people and their communities.
- Growing human and social capital.
- Recognising inter and intra-generational equity.
- Promoting healthy living and a culture of learning.

'Managing the Pain'

The cultural sea-change required can be characterised in the context of a number of separate but linked domains, shown in table 3. The first column shows the five domains. The second column follows the work of the World Business Council for Sustainable Development (WBCSD) in describing some potential market approaches for achieving sustainable development in each domain, and the third column shows how sustainability will be either driven by negative pressures (such as bio-diversity loss) or positively effected through the realignment of personal values, for example, achieved via legislation and regulation.

'Maximising the gain'

These are now all very real challenges for business, and fulfilling demanding sustainable goals in a manner that will avoid commercial disadvantage will require businesses to operate very differently from today. The importance of people and their knowledge as wealth generators will need to be asserted. Enlightened and committed business leadership is required to maximise the gain. This would involve promoting investment in technical and social innovation, testing for sustainability along the length of the value chain and encouraging a top-down ethical business stance. None of this can be achieved without radical changes to old style management models. These changes might include a distributed leadership model or communities of leaders. Flatter organisational hierarchies, or holistic and integrative approaches throughout organisations and their value chains will be necessary to provide the peer pressure to exact change.

The business community made a significant contribution to the Johannesburg Summit and the negotiations led to three spheres of responsibility being identified; the first being the active promotion of corporate responsibility and accountability by fully developing and implementing intergovernmental agreements and measures. Secondly, that a 'precautionary approach' be adopted with states accepting a duty to protect the environment from new products, even if there is no conclusive scientific evidence that they could damage an ecosystem. The third sphere is that 'good governance' should promote transparency and accountability in financial systems.

Finally, these ideas, eminently

Table 3: Domains of Sustainable Development

Domains	Sustainability through the Market	Cultural Change and Sustainability Business Drivers
Human	Innovate-technically and socially	Competition for knowledge and leadership skills. Alignment of organisational/personal values.
Natural	Establish the worth of the Earth	Environmental degradation, waste generation, bio-diversity loss, climate change, altered demand for products/services, public attitudes.
Financial	Improve the market framework conditions including access	Need for profit/growth, discerning investors, access to capital, challenge to GDP.
Manufactured/Physical	Practice eco-efficiency	EU/UK government; public and regulatory pressure for physical assets based on: energy efficiency, resource efficiency, procurement and supply chain pressures.
Social	Provide and inform consumer choice	Public mistrust of business, increasing expectations of responsible social and environmental and financial behaviour.

auditable, are encapsulated in the words of Sir Mark Moody-Stewart, which provided the finale to the Summit – the Johannesburg Business Pledge:

- Sustainability is the opportunity which we embrace.
- Responsibility is the standard by which we should be expect to be judged.
- Accountability is the obligation which we assume.
- Partnership is the pathway which we pursue.

An Environmental Business Cluster: A Case Study.

James Cass, Centre for Alternative Technology.

This article describes the development of a cluster of environmental businesses around Machynlleth, in the Dyfi valley near the mid Wales coast, and their relationship to the Centre for Alternative Technology (CAT). Consideration is also given to some of the factors that have been significant in creating the Dyfi-Eco Valley; one of Europe's most successful and well known eco-clusters.

The Centre for Alternative Technology now has over 30 years experience of turning passionate environmental beliefs into *practical* solutions. In the late 1960s and early 1970s, organisations like Friends of the Earth and Greenpeace were campaigning for greener lifestyles, but increasingly, practically minded environmentalists started searching for the solutions to environmental degradation by asking - *how can people live modern lives with high levels of comfort without damaging the ecosystems that act as our life support system?* CAT was initiated in response to this stimulus, to act as an experimental eco-town, testing, researching and improving environmental technologies by living and working with them on a full-time basis.

Three decades later CAT is an independent environmental education centre, and a cluster of micro businesses offering unparalleled experience in the emerging business sector of sustainable technologies. CAT now access over a million people a year, have around 150 employees and a turnover in excess of £3million. The Centre has a world wide reputation for innovative sustainable solutions and is the inspiration behind other centres abroad such as Sonairte (Republic of Ireland) and Terre Vivante (France).

Operating on a 40 acre site, originally the Llwyngwern Slate Quarry, there is now a visitor display circuit that highlights many types of environmental technologies, an education centre that runs courses for adults up to MSc level, and a schools education programme for all ages that caters for residential visits in eco-cabins with autonomous power and water systems. The centre also provides day visits. CAT has the UK's most successful Free Environmental Information Service, an award winning website and a research and consultancy service, as well as being an environmental book publisher, and a thriving membership organisation. There are two retail outlets, two cafes, a mail-order business, and a community of residents on the site - all of which is managed co-operatively.

CAT's international reputation for sustainability expertise is built upon the fact that no other independent eco-site has its endurance or type of experience. In particular this means that CAT's consultants are in constant demand to provide sustainable solutions for renewable energy and energy conservation; environmental building; organic sewage and waste water treatment as well as water conservation.

Over the years CAT has been an environmental beacon attracting thousands of environmentalists to work or volunteer. Of these, a number have been inspired to stay in the area and set up environmental businesses. Table 4 below lists 26 businesses that have either spun off from CAT directly or exist because of strong associations with CAT. All but three are located in the immediate area.

Dulas Engineering, based in Machynlleth's Dyfi Eco Park, specialises in providing renewable energy solutions. It is the largest spin off from CAT with a turnover of £3 million, a staff of 25, its own research and development department and a loyal international clientele who value its highly innovative approach to problems. One example of this is the solar powered immunisation fridges provided for the UN's World Health Organisation – these fridges have provided a highly successful solution for keeping vaccines at the correct temperatures in countries suffering from unreliable electricity supplies.

In 1982 Dulas was part of CAT's engineering department, facing the demands of project work as well as running CAT. By moving off site, Dulas was able to take a more commercial approach to renewable energy. Many of the features of CAT's management structure were retained. For instance, Dulas is structured as a co-operative and retains a flat salary structure and CAT's Development Director retains a place on Dulas' Board. Since separation the company has flourished by achieving a very strong reputation for

Table 4: Businesses Connected with CAT.

◊ Dulas Engineering – environmental engineers	◊ Blanche Cameron - environmental architecture design
◊ Ecogen – wind power	◊ Pat Borer - environmental architect
◊ Aber Instruments – specialist technical instruments	◊ Andy Bakewell – eco tourism
◊ Natural Solutions – eco sanitation	◊ Gardening for Good - Permaculture garden designer
◊ Elemental Solutions – eco water system designer	◊ Dyfi Eco Park – an eco industrial park
◊ Elemental Earth – environmental educationalists	◊ Corris Eco Youth Hostel
◊ Blooming Things – organic plant suppliers	◊ The Very Efficient Heating Company – solar water heating specialists
◊ Dyfi Organic Growers – organic vegetable box scheme	◊ 3 environmental building contractors
◊ Cwm Einion Organic Growers – organic vegetable producers	◊ Nick Mills – domestic renewable energy solutions
◊ Green Teacher magazine	◊ Carpenter Oak – green oak construction
◊ Dyfi Eco Valley Partnership – community environmental organisation	◊ Greenheat – renewable energy facilitators
◊ Green & Gold – environmental fundraisers	◊ The Willow Bank – willow constructions

competence that culminated in the Wales Exporter of the Year Award in 2002.

Aber Instruments is another successful commercial spin off from CAT, manufacturing yeast and biomass monitors. It employs 20 people, has a turnover of over £1million and in 1998 won the Queen's Prize for Export Achievement. Aber Instruments owes its origins to an idea conceived between a CAT engineer and a professor visiting from Aberystwyth University, for an electronic method of monitoring live cell development. Funding was provided by the DTI and ICI to develop and patent the instrument. Being part of CAT's engineering department was not a problem when demonstrating and selling to academia, but it soon became clear to Barry Wise, Aber Instruments MD, that the commercial markets the firm sought to access would be better served off-site, while retaining a number of CAT's ideas; among them a relatively flat pay structure and an inclusive management style in order to build a strong team.

Elemental Solutions is another example of a CAT spin off, started in 1996 by two people after a spell of volunteering at CAT. The firm provides natural sewage solutions such as reed beds and rain water harvesting systems. As dedicated environmentalists, the duo deliberately keep the company small so that they can maintain their research programme. These intellectual and environmental, rather than commercial motives, also allow the company to sustain a symbiotic relationship with CAT which involves free interchange of research and ideas as well as teaching on courses and collaboration on publications.

Elemental Earth is a very successful local community organisation formed by former CAT educationalists. They moved from CAT in order to work on environmental issues with the local community. They now run many events and festivals in the area from lantern processions to organic gardening clubs in schools, and have been extremely successful in attracting arts funding.

Dyfi Eco Valley Partnership is another successful community organisation. Like Elemental Earth, it formed in order to bring the benefits of sustainable lifestyles to the immediate locality. Its role is to run self help groups like Solar Club, as well as disbursing grants for local environmental schemes and promoting eco-tourism. So far it has been able to award over £350,000 to 26 local schemes, installing over 250KW of clean power. Renamed Ecodyfi, the organisation has become the de facto development agency for the valley, employs five people, and is developing sustainable waste, energy and transport plans for the area.

Green and Gold is a CAT spin off based away from the valley. After working with CAT as part of a team from a fundraising agency, its founder, Sally Pettipher, recognized that a new sustainable technologies market was emerging. The firm was the UK's first specialist environmental fundraising agency to service the sector, raising many millions of pounds.

CAT's pioneering vision was to create a model for environmentally sustainable villages rather than to create a cluster of environmental businesses. However, there are a number of explanations for this outcome. First, in a reversal of recent rural Welsh trends, CAT has acted as a 'beacon' enterprise by attracting highly skilled and qualified people into the area; drawn together by their passionate wish to demonstrate that society can be changed to live symbiotically within the cycles of nature. Crucially, CAT has acted as a 'parenting' organisation by offering an inspirational goal, freely sharing its knowledge through mentoring and apprenticing schemes, encouraging individual creativity, acting as an evolving repository of knowledge, and valuing everyone's opinions and expertise by using a co-operative management and a flat pay structure. In the end, of course, there are limitations which themselves encourage people to take advantage of the market for environmental goods and services that CAT has spent its lifetime encouraging. The empowerment created when like-minded people group together, their willingness to work hard for little financial return and finally, the invaluable institutional support that CAT has received at crucial times, have all substantially contributed to the development of the business cluster.

Over 30 years, starting with the development of a lifeless industrial brownfield site and using the principles of sustainable development, the decline of a traditional rural Welsh community has been halted and supplanted by a thriving business community with an annual turnover of around £10 million in the emerging market of environmental sustainability, and this is only the start. Now that 70% of the UK population believes that human activities are degrading the environment and want to do something about it but yet feel unguided, CAT feel that the market for sustainable goods and services can only increase, especially as it will be driven by the UK government's target to reduce carbon emissions by 60% by 2050.

What is very important for Wales is that it has a small head start in the emerging technologies of the environment. If it recognises and seizes this opportunity there is no reason why in 50 years time Wales shouldn't be seen internationally as the world's knowledge capital for sustainable technologies.

Engineering a Sustainable Future.

David Williams, Managing Director, Cambrian Engineering.

Introduction

All energy comes from the sun. Nuclear energy is as old as the earth, oil and coal formed millions of years ago, wood formed several years ago, vegetable oil crops formed this or last year, wind and tidal energy is generated daily, while solar cells and panels generate energy instantaneously. The older the energy, the dirtier it tends to be.

New energies are clean. They harness the sun's energy immediately or soon after it has arrived. This is renewable energy in the sense that the cycle of delivery and harvesting is repeated at short intervals and requires no intermediate quiescent form, as does oil and coal. New energy accounts for a tiny portion of our consumption, but its potential is limitless. A number of forms require significant advances in technology, but history teaches us that these will occur and costs will fall.

Obstacles to wind energy development

Despite the planning process, highly articulate minorities who rely on the inertia of the majority have been able to influence the energy agenda in order to protect their own interests. Meanwhile, the public understand well the benefits of wind power versus fossil fuels and nuclear energy, and appear not to be fazed by new devices required to harness this energy. Within a generation, the old objectors to wind farms will be replaced by new generations familiar with the methods by which clean energy is harnessed. Without an acceptance of change, human progress would certainly be much slower.

Objections to wind farms come from many quarters including successful, well educated individuals moving from environmentally abused locations to picturesque rural locations where locals often are poorer. Others want the countryside to retain its natural beauty for their occasional visit, and resent the appearance of wind farms on their visible horizon. There are many cases of locals being deprived of new employment opportunities because

incomers or visitors have influenced planning decisions. Country Guardian provides one example of an organisation seeking to 'protect' the countryside for visitors, newcomers and owners of second homes. Meanwhile, organisations such Greenpeace, Friends of the Earth, World Wildlife Fund, and RSPB support wind energy. Wind farms are carefully located so as not threaten ground wildlife or bird migration paths.

Strategies to support the renewable energy sector in Wales

The sector needs to appeal to the younger generation and to give older people an opportunity to support efforts that will leave a better environment for their children and grandchildren, while also providing economic opportunities for rural communities. In Wales, it would be helpful to compile a database of sustainable energy supporters. Increasing demand for tower support systems for on and offshore turbines has injected the necessary confidence to now enable the supply of components for UK wind and wave projects, from within the UK and manufactured by a UK workforce. This has also contributed to a growing export business to Denmark, Germany, Holland, Greece, Crete, Switzerland, Eire and the USA during a period when the Euro was valued around £0.59 – £0.60. However, this rapidly growing new sector is highly competitive. Established European manufacturers have already signalled their intention to supply the steel components for UK offshore wind farms.

Wind industry costs in the UK are constrained by the market price of electricity. While competitors in Europe face a steady demand for towers and monopiles, the UK wind industry has been subject to unpredictable fluctuations, especially in Wales, with the result that only one firm remains out of the original five.

Following Kyoto, the Welsh Assembly Government is determined that Wales should increase the share of electricity derived from renewables by 2010; an easily achieved and widely accepted minimum would be 750MW from 300 onshore and 200 off-shore wind turbines. The onshore projects require approximately 50 square kilometres or less than a quarter of one percent of Wales' total area. These are modest targets compared to England and Scotland where each country has plans for a minimum of 3000MW.

To meet its renewables obligation, the UK will be installing around 7 GWh generating capacity during the next 9 years. The towers needed will be sufficient to keep busy five companies larger than Cambrian Engineering, and could create an additional 500 direct jobs and at least another 500 from sub-contract and supplier services; an employment growth which began in 2002. Hence, offshore wind farms represent a significant economic opportunity in Wales. Already the Crown Estates has granted licences to develop 18 off-shore wind farms of 30 turbines each, requiring some 400t of fabricated steel. Current expectations are that these will be built during the next 5 to 6 years. These figures do not take into account the 500MW of Irish onshore projects which have planning permission already and total Irish Sea off-shore projects which amount to well over 1500MW. Subject to planning consents, demand from 2004 to 2006 will be for around 540 towers around the UK; with 65% of them between the Severn Estuary and Barrow in Furness. A further 500 turbines are planned for Eire in a similar period.

In the mid 1990s Wales was at the forefront of a growing wind industry, and there were initiatives and events to encourage Welsh companies to diversify and benefit. Local developers were putting forward a good number of projects in Wales which would stimulate other companies to start-up or diversify. As a result, Vestas, the World's No. 1 turbine manufacturer, considered setting up turbine assembly and component manufacture in north west Wales as it has in some 15 other countries around the world.

A brief history of Cambrian Engineering

Cambrian began as a lifting equipment supplier in 1976, later diversifying to lifting beams, gantry and crane fabrications, then further to construction industry steel fabrication. These activities were abandoned following the early 1990s recession. In 1996, the firm was encouraged by the DTI, the Welsh Office and the Welsh Development Agency to commit to the production of wind turbine towers. Confident assurances of rapid growth were given to Cambrian and to manufacturers of turbines, and with the promise of supplying towers for two local wind farms, the firm invested in the additional equipment required.

During this time, developers were putting forward projects, of which only a few received planning consent. The planning approval process appeared to have become hostage to anti-wind lobbyists. As a result, only a small fraction of the forecast projects were achieved in the period 1996 – 2001. Indeed, both projects upon which Cambrian relied were delayed for over a year with near disastrous consequences. The then Secretary of State for Wales, Peter Hain, aware of the Cambrian commitment to the initiative, intervened to encourage support until the towers were produced and Cambrian was out of danger.

In the late 1990s, Cambrian was reliant on export orders, accounting for 80% of output. The biggest customer was Vestas, the world leader in wind energy systems. The period was characterised by poor UK demand at a time when the company had yet to establish relationships with developers and turbine makers. By 2000/01, Cambrian Engineering was in a position to invest in a process line and develop procedures for tower production, able to cope with small to medium sized monopile structures, several of which have subsequently been manufactured.

In 2002, planning approvals both on and offshore improved. Vestas, recognising UK market potential, proposed a joint venture with Cambrian to set up a turbine assembly facility in north west Wales with the potential to create up to 200 jobs. Unfortunately, Wales had developed a reputation as a 'no-go' area for wind farms and Vestas turned to Scotland where attitudes were more positive, opening a facility, including tower manufacture, at Mackrahanish.

By the end of 2003, Cambrian's Bangor facility should be operating at full capacity, but additional capacity is needed for the large tonnage support structures for offshore and the corresponding rise in onshore build. Monopiles for offshore wind require a quayside location. Conditions were not right for such a facility in north west Wales but rather a recently refurbished fabrication facility has been acquired on Lewis in the Western Isles.

A positive swing in UK wind power prospects can be traced to:

- Central Government Renewables targets coupled with the Renewables Obligation.
- The positive contribution of a Minister prepared to take a lead.
- The 'go-for-it' example of Scotland.

In addition to the above, the following considerations have been key to Cambrian's activities in Scotland:

- Central Renewable Policy will be sustained and perhaps further emboldened with firmer targets, greater pump-priming finance plus support for appropriate grid strengthening and interconnector development; all crucial to investor confidence in the sector.
- Predicted growth in demand for offshore wind generation over the next decade.

- Prospective substantial steel fabrication opportunities for wave and tidal power devices.
- A positive posture in Scotland for growing onshore wind generation; the large Barvas Moor project is a key factor.
- The prospects for Lewis to become an energy innovation zone.
- Arnish Yard quayside location.
- The size of the building, external handling and storage space, heavy steel fabrication pedigree and infrastructure.
- An accessible skilled labour pool.
- Combined, organised and integrated support from Highlands and Islands Enterprise (HIE), Western Isles Enterprise (WIE), the local Authority and the landowner.

It is anticipated that the locality will benefit through direct and indirect job creation, in an area which has experienced a declining population and low levels of prosperity. There may be opportunities for the locality to become a world class engineering centre serving this market sector, retaining and further developing the skill base on the island. By attracting other renewables production/assembly activities, the area could build up an expertise cluster creating further jobs; perhaps a 1,000 over the next 4 years. Export revenues from electricity generation will supplement tourism, while allowing the environment to repair itself through reductions of CO_2 emissions, using an industry that is the very essence of sustainability. Farmers will also benefit via schemes like Windworks by 'farming' wind energy as well as crops, sheep and cattle.

Roosevelt said – "Do what you can, with what you've got, where you are". Wales is gifted with perfect natural resources and I believe the wind industry can play a major part in building a better future for people in Wales, working for Wales.

A Sustainable Waste Strategy.

Peter T. Jones, Biffa waste Services Ltd.

In the context of waste reduction, the UK is rightly developing an approach based around sector/supply chain/product sustainability strategies. This is eminently logical given that the last 200 years has seen the emergence of internality-based valuation systems developed in the context of markets where environmental impacts were largely free of charge or marginally priced. Nevertheless, as environmental impacts became subject to restriction of pricing, market distortions were introduced resulting in subsidies, imperfect regulations and the introduction of Traded Permits based on poor databases. The underlying ethics of Producer Responsibility lie in the opportunities for achieving product and supply chain reconstruction as authority and responsibility are merged into the single waste producer/polluter.

The challenge is to define who is the producer – is it at the front of the pipe or the end of the pipe? In the UK there appear to be concerns from within the Treasury that the unbridled introduction of Integrated Product Policy[1] (IPP) with cost liability at the front/manufacturing end of the supply chain will result in inflationary and wealth transfer impacts for the poor since they will be obligated with the same unit based pricing pressures as the wealthy. Such a taxation route is thus regressive.

Producer Responsibility also has to be considered in a limited sense insofar as it only impacts on a maximum of around 15 million tonnes of products which can be realistically priced/obligated in this way. Nevertheless, many of these products are complex multi-material, high environmental impact goods with high levels of embedded carbon and other energy potential.

A further dilemma centres on the extent to which manufacturing Producer Responsibility obligates those manufacturers to influence design in terms of in use embedded energy efficiency – which traditionally amounts to 8 or 9 times the lifetime impact of consumer capital goods compared to those of pure manufacture.

In the UK dilemmas operate insofar as environmental instruments waver between the Freidmanite, market led approach (implicit in Producer Responsibility) and the Keynesian, market support, subsidy led route (associated with the "carrots" provided to shift consumer behaviour in the municipal waste chain). The balance between these two diverse approaches needs to be considered in a more product-centric way.

In financial terms these balances can be considered by comparing the Tradable Permit system emerging for packaging, whereby 5 million tonnes has transferred around £120m of value within the supply chain. For the overall 15 million tonnes, product, total retrieval and processing cost from the waste industry might amount to £1.5bn based on £100 per tonne. Currently around £600m of subsidies is being pumped into the public sector. Either way the brunt of these costs is being borne by taxation.

The economics

On a worst possible case, if the 15 million tonnes of recovered material involves logistics and processing costs of £200 per tonne, this is a £3bn gross impact in a £1 trillion GDP – 0.3%. Those costs need to be analysed by their main sectoral impacts:

2 million tonnes automotive
1 million tonnes electrical and electronic
10 million tonnes of packaging
0.4 million tonnes of tyres
0.3 million tonnes of household hazardous waste/batteries

One needs to offset against that £3bn incremental cost the £500m-£600m of subsidies currently passing to local authorities to encourage them to install kerbside recycling schemes (which would become the responsibility of the supply chain pricing system). Additionally, £800m would come off central government obligations covering the local authority costs of disposal currently incurred in disposing of 15 million tonnes at around £50 per tonne for collection and landfill. In addition, one can deduct a further £200m on the basis that 4 million tonnes of packaging was recovered in response to undistorted market signals prior to 1997. Thus, the net incremental economic impact in the economy is likely to be of the order of £1.5bn (0.17% of GDP).

Sector impacts

It is important to understand that due to weight, hazard and volume differentials between different products, the logistics and end life processing costs for different materials will vary on a tonnage basis. Counterbalancing that impact against the current internality GDP value for that sector creates substantive variations in the impact on ex works costs. In some cases these will be unavoidable in the long term because technology development is perceived to be at the very edge of the laws of physics (fluorescent tubes and mercury, for instance). Table 5 summarises the position.

Each of the industries in table 5 experience substantive differences in elasticity of supply and demand, with a consequence that a more pan-European approach might be appropriate if individual nation states are to avoid freeloaders exploiting market differentials.

Who is the producer?

In the UK, in packaging, Producer Responsibility is shared through a complex relationship between manufacturers, filler packers, wholesalers, retailers and reprocessors. In cars and electricals it is emerging that primary manufacturers are seen to be the producers whilst retailers mount reasonably successful efforts to avoid liability.

Table 5: Sector Impacts

Product	Tonnage/Units	Neutralisation Cost	Sector Turnover (Retail)	Percent (ex Works) Increment*
Fluorescent tubes	80 million	£80m	£120m	100%
ELVs	2 million	£200m	£50bn	1%
Electricals	1 million	£200m	£40bn	1%
Glass	2 million	£80m	£500m	16%
Tyres	0.4 million	£30m	£1bn	5%

*Ex works turnover estimated at 50% retail value.

The benefits of Producer Responsibility

To be effective, Producer Responsibility needs to produce a coincidence between liability and benefit. Tradable Permits are the appropriate mechanism for this process but the central question is "who is the banker/issuer of proofs and recipient of the resultant economic gain?" In classical systems developed for SOX and NOX emissions, trades should be intra-sectoral at equivalent points in the supply chain – in the latter case, electrical generating stations. In the UK, split responsibility leads to conflicting economic messages with reprocessor benefiting from income streams associated with payments for proofs when those making payments are obligated as a function of their total consumption – regardless of any individual internal methods and systems they apply to ensure material is recovered and recycled/reprocessed. There are thus no incentives for the supply chain to change behaviour because the charges for certificates cannot be varied. This is not a pure Tradable Permit system.

Also in packaging the emergence of new technologies – such as utilising glass in road surfaces – enables multiple bankers to emerge who are not even involved in returning glass into the original packaging circuit. Thus construction companies can secure rights from the regulator to issue Tradable Permits and values are transferred from the packaging industry into construction, completely outside the control of the packaging sector.

The system envisaged under the Waste Emissions Trading Bill, currently before the UK Parliament, is that for municipal waste and organic flows to landfill, the government will act as banker with single point liability embedded in the Waste Disposal Authority/unitary waste production authority. Trades can proceed on a bilateral basis between those who underachieve and those who exceed their target with government acting as lender of the last resort (presumably at a punitive rate although this is yet to emerge).

In the carbon trading system there is multipoint obligation for impacts and multipoint obligation for sequestration with a quango – The Carbon Trust – acting as the banker. In tyres and electrical goods there will be single point responsibility on manufacturers but the regulator will police the overall system and is likely to emerge as the banking facility. It is suggested that the anomalies and inconsistencies of these multiple systems are unlikely to be tenable on theoretical economic grounds. Obligation and benefit must be co-joint and fundamental decisions need to be made with regard to the relative roles of the reprocessor, government and regulator as arbiter of the appropriate mechanisms.

The degree of product specificity – to create more perfect market conditions – also needs to be counterbalanced against the advances of material based (steel, non ferrous, plastics, rubber, etc) systems based purely on weight. An example is in electrical and electronic goods where subcategories are likely to emerge in relation to electronics, consumer white goods and consumer brown goods based on material retrieval rates for each category.

The complexity of such different approaches also raises questions in terms of consumer education and comprehension.

Implementation and the regulatory link-in

Requirement 1 – Data

No system can operate effectively involving Tradable Permits, targets and other yardsticks unless it is founded on a sound database capture infrastructure. Data capture systems must be online, working to common protocols within a strategic government framework between local authorities, the waste industry, the reprocessing sector, and the regulatory and public information systems, to ensure near perfect market conditions for trades.

There is also a requirement for common links along supply chain protocols to ensure that freeloaders are identified in the form of non-reconciling mass balance of inputs and outputs as material flows across boundaries between manufacturers / filler packers / retailers / waste industry.

Requirement 2 – Financial reporting

There is a requirement for international accounting standards bodies to address the valuation of Tradable Permits in terms of profit and loss and balance sheet accountability standards. In some sectors where the ratio of internality/externality costs is near equivalence, the impact on profit and balance sheet perceptions could be major – resulting in financial exposure to takeover for participant companies.

Requirement 3 – International commonality of systems

Many product areas subject to IPP initiatives are by definition operating in monopsonistic or oligopolistic market environments dominated by international trading companies – whether in packaging, automotive, electrical goods or other similar products. As a result it is necessary to ensure that trans-national simplicity applies so that international competitive factors are not distorted. This could create a potential role/need for a European Environment Agency responsible for audit and control of appropriate data. It could be considered inappropriate to allow national government regimes to police intra-national systems. The EEA as a trans-European regulator would also have a role in determining targets for pan-European standardisation.

Requirement 4 – Competitive issues
There is a requirement to involve national and European competitive regulation agencies (in the UK the Office of Fair Trading) to avoid accusations of market distortions, incorrect pricing, market fixing and reporting transparency.

Requirement 5 – Consumer Education
IPP/PRO needs to be seen in the context of wider consumer environmental education initiatives. Systems which emerge with multiple responsibilities/responsibility on producers/ responsibilities on intermediates will appear inconsistent, incomprehensible to end market consumers and will impede national government efforts to increase recovery and reclamation rates. Major brands are also subject to increasing market risk as a result of real and perceived aberrations in relation to environmental and ethical best practice and they can be expected to demand reasonable transparency and consistency to avoid individual accusations of market exploitation if compliance rules are lax.

Requirement 6 – Timescales
Within the UK there is an attitude of resistance and deferral to these regulations. Why is this so? There should be more positive approaches to grasp the nettle and realise the interrelationship between sound environmental practice, Producer Responsibility and the exploitation of market share based on perceived image. Of 1,000 companies in the FTSE classification in the UK, around 90 currently issue Corporate Social Responsibility reports of a reasonably quality. They are likely to form the basis for any expansion of reporting initiatives.

Conclusions
Producer Responsibility is both a threat and an opportunity insofar as:

- In a future framework of virgin input taxation of non-renewable resources, the concept of recovering pre-life cycle products raises the opportunity for competitive cost advantage.

- New industrial synergies are being created between industry sectors, which formerly never communicated with each other – directly or through an intermediary (tyres and cement, local authorities and construction, retailers and aggregates companies, etc).

- Producer Responsibility provides product manufacturers with the opportunity to reconsider their direct linkages with their end customer base – knowledge of where their products are being utilised and sold via product liability at end life means the possibility of bypassing retailers through an electronic web based sales system.

- IPP focuses corporate thinking on opportunities for greater resource efficiency, which, in the long run, should translate as greater cost efficiency in the event that government taxation systems gradually shift from taxes on labour to taxes on resources.

- In the waste sector there will be a growing tendency for integration of household, commercial and industrial waste retrieval systems and processing technologies to realise economies of scale.

- IPP systems should be regarded, ideally, in a self-governing framework with minimum reliance on artificial regulation.

- In the UK there may be opportunities for the regulator and the Department of Environment, Food and Rural Affairs (DEFRA) to act more in a standards formation/compliance framework stating role, and for the DTI and the Office of the Deputy Prime Minister (ODPM) to assume responsibility for compliance targets in a delivery sense for commercial and industrial and domestic wastes respectively.

Note
1. Integrated Product Policy is an EU policy under development, aiming to 'green' the product life cycle, by including all stakeholder viewpoints.