

Transition Pathways



A first Energy Descent Plan for the Lampeter Area

April 2011



Photo: Transition Llambed



Cronfa Amaethyddol Ewrop ar gyfer Ddiwygiu
Gwledig; Ewrop yn Buddsoddi
mewn Ardaloedd Gwledig
The European Agricultural Fund for
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Rural Areas



Uywodraeth Cynullid Cymru
Welsh Assembly Government

“I think there are good reasons for suggesting that the modern age has ended. Today, many things indicate that we are going through a transitional period, when it seems that something is on the way out and something else is painfully being born. It is as if something were crumbling, decaying, and exhausting itself— while something else, still indistinct, were rising from the rubble”

(Václav Havel, playwright and Czech president).

About Transition Llambed

Transition Llambed is an unprecedented, community-led, exciting project aimed at addressing the twin challenges of Peak Oil and climate change. Peak Oil is when oil production equals oil demand which will result in dramatic price rises of fossil fuels such as petrol. After Peak Oil, demand will exceed supply as the world's oil supplies gradually decline. This needn't be a bad thing and the idea behind the Transition Town concept is that if we all act together, we can plan our 'energy descent'. Thus we can devise a life for ourselves which, yes, is more eco friendly but ultimately, is much more fun, abundant, joyful and rewarding than life before Peak Oil!

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Summary

Transition Pathways outlines a plan for local solutions to the challenges of impending crises in energy supply and climate change. It is intended to put some detail and incorporate comments on the draft strategy, *Lampeter 2030?*, produced in November 2010.

The twin challenges of climate change and peak oil mean that in the next few decades the world will have to make do with declining availability of traditional sources of energy and resources.

We start with an overview of the challenges facing us as a result of climate change, peak oil, food security and financial instability (*Why an Energy Descent Plan?*). We go on to present a brief look at the “Preparing for Energy Descent” area, the current ecological footprint, the results of the “Living in the Lampeter Area Survey” and look back at a time not long ago when the area was largely self-sufficient.

In *Future Scenarios*, we have attempted to imagine some possibilities, rather than predict the future, in order to frame the discussion in global and national contexts.

Visions of a better future presents a positive vision of 2030 compiled from group-work over the course of the project.

The vision gives a positive idea of what life could be like by 2030, assuming that the major challenges of our time are successfully tackled locally. Though things are very different, and access to energy and resources still present problems, people are generally healthier, happier and more fulfilled.

We then move on to considering how we might achieve this positive vision.

Profound transformations in the economy, renewable energy, energy efficiency, transport, food and agriculture are required in order to rise to the challenges of energy supply, climate change and food security.

The key to this transformation is the shift to a ‘cradle-to-cradle’ economy, based on a fundamental re-design that mimics natural cycles. The economy is powered by renewable

energy, waste is designed out of the system and products are made largely from renewable resources. This re-design applies to all sectors, including public services.

Then the main areas to address are looked at. *Reducing our energy needs* focuses on domestic heating and transport as the main users of fossil fuel energy. In *Renewable Energy* we propose that electrification will be the key to achieving low carbon energy supplies, and what this might mean for the area if it attempts self-sufficiency in energy. *Food and agriculture* outlines the impacts of the current situation on our footprint and makes some suggestions for reducing these while achieving food security.

In *Working together for sustainable change*, we point out the vital link of promoting behaviour change towards sustainability, both in individuals and organisations. We look at the pros and cons of information-based campaigns, social marketing and values-based “identity campaigning”. The role of leadership for sustainability is highlighted to bring about change in organisations.

In conclusion (*A Transition Pathway*), we draw together the main elements to address as priorities in the short to medium term. We reiterate the point that local solutions must be found as we cannot rely solely on government action in time to avert multiple crises. From a technological point of view, the solutions outlined here are achievable, but putting them in to practice will require enormous effort, particularly in engaging the support of the population at large as well as local agencies and business.



Photo: Transition Llambed

Why an Energy Descent Plan?

Human history has been characterised by an ever-increasing availability and use of energy – *energy ascent*.

The basis for this pamphlet is that we are about to move into the unknown – *energy descent*.

The twin challenges of climate change and peak oil mean that in the next few decades the world

will have to make do with declining availability of traditional sources of energy and resources.

Transition Pathways tries to sketch out a positive vision of the future, and contribute to understanding the necessary steps to get there, so that we can start working towards a better future now.

Had I lived little more than 150 years ago, I would have worked during daylight and gone to bed when it was dark. I would have rarely travelled beyond the town next to my own, and would have got around mostly on foot or by horse-drawn cart (I doubt on one of those new shakey-looking bicycle things). I would have grown my own vegetables or bought local produce, and would have worn thick stockings and skirts - maybe even gloves - around the house to keep myself warm. Now I stay up late on the computer or watching TV. I journey by train to the capital a few times a week, sometimes driving to the main line first, and fly overseas once, maybe even twice, a year. I can buy parsnips in summer and apples from New Zealand. I occasionally wear socks in bed, but otherwise ... you get the picture. In a very short period of its history, humanity has managed to turn nature's apparent blessing of oil, gas and coal into something closer to a curse. In a far shorter period of history, we must act to prevent our dependence on them from destroying us altogether, whether through environmental devastation caused by energy emissions or social disintegration caused by the pipelines running dry - or, indeed, both. (Mann, 2005).

Peak Oil

For the last two to three hundred years rapid energy ascent has been possible due to the extraction and burning of fossil fuels.

This has reached the extent that our economy, our society, is totally dependent on abundant supplies of cheap oil. Oil is essential to our food production, transport, heating, medicines and nearly everything we use.

This cannot and will not last forever, and it is becoming gradually accepted that things are about to change.

Peak oil is upon us.

The US Department of Energy (USDEA) describes peak oil as "a reservoir's maximum oil production rate, which typically occurs after roughly half of the recoverable oil in a reservoir has been produced". When peak oil happens on a global scale, the impact will be profound, given our almost total dependence on oil.

USDEA goes on to say that this is an "unprecedented risk management problem ... as peaking is approached, liquid fuel prices and price volatility will increase dramatically, and ... the economic, social and political costs will be unprecedented" (Hirsch et al, 2005). Global peak oil does not mean that oil will have run out, but that the peak of production has been reached. From then on production will be in permanent decline. Demand, especially from rapidly growing economies like India and China, will continue to rise. This will lead to wildly fluctuating prices as markets try to cope, but the general trend will be upwards, threatening economic chaos, unless alternatives to oil have been established prior to peak. At present there is little sign that governments are seriously preparing for peak.

When is this likely to happen? Estimates vary considerably, but tend to put the date within the next two or three decades. The International Energy Agency (IEA, 2010) states that "*the age of cheap oil is over*". It suggests

that even if international energy policies act to address security of supply, the IEA shows conventional oil production to be static to 2035, and much of that production is based on “fields yet to be developed or found”. Demand for oil is expected to continue to rise dramatically. Between 2007 and 2035, “total energy demand in non-OECD countries increases by 84 percent, compared with an increase of 14 percent in OECD countries” (IEA, *ibid*, p1).

It is not only the oil supply that is threatened. Many of the resources of our planet that we currently take for granted are non-renewable, and running out fast. Gas, for example, looks set to peak not long after oil. Crucial metals, and even apparently commonplace elements such as zinc, copper and nickel, are also finite (Cohen, 2007). We could soon have to face what Richard Heinberg (2007) has called ‘peak everything’.

Climate Change and Environmental Degradation

In the last 50 years it has become increasingly clear that our exploitation of resources is resulting in environmental destruction on a scale that has not been seen in human history. The climate is changing, species are dying out, wild places are being destroyed. The services of nature on which we all depend are disappearing before our eyes.

Climate change is now a matter of scientific consensus: it is happening now, and it needs to be addressed just as much as peak oil. Put simply, as we continue to burn up what remains of our fossil fuels, destroy forests and degrade soils, we are releasing carbon dioxide and other greenhouse gases into the atmosphere. In turn this prevents heat from escaping, and this process contributes to the overall warming of the earth. It has been widely accepted that we need to limit the temperature increase to two degrees Celsius to avoid catastrophic consequences. With any significant increase these consequences would include extreme weather, droughts, floods, and irreversible effects on natural ecosystems and agricultural land (IPCC, 2007). While we suffered from an unusually cold winter in 2010, other parts of the world suffered almost unprecedented floods

(e.g. parts of Australia, Brazil, Pakistan and Sri Lanka). Such occurrences are likely to become more frequent as the differential effects of overall global warming are felt in different parts of the world.

Sea level rise is another consequence of climate change, as land-based ice caps melt and warming causes the oceans to expand. Ceredigion is likely to be vulnerable to this threat, with much of the population located near the sea, and in combination with the already serious threats of coastal erosion.

Climate Change is another problem that is not being dealt with adequately. Far from reducing our carbon output, in the past twenty years the global carbon footprint has actually increased by almost 40% (Jackson, 2009, p 50). Morally, we owe it to all life on the planet, not just to our species, to do our utmost to tackle climate change.

Peak Food?

Current food production is unsustainable, due to climate change, shrinking water supplies, land degradation, loss of land to biofuels, the growth in demand for livestock products and the fact that at least one-third of all food produced is wasted. We are on the brink of global hunger: two billion people in the world already do not get enough to eat already. Governments are not taking the problem seriously. The challenge requires the same sort of revolution in the way the international community deals with it, similar to attempts to address climate change. Often the solutions are relatively simple; for example half the food in Mozambique rots before it reaches market, requiring investment in infrastructure for transport and storage. Such solutions are expensive but not complicated. The Punjab became the grain basket of India in the Green Revolution, but farming there is becoming increasingly difficult, with declining yields and resistant pests, suggesting that more inputs of fertilisers and pesticides are not always the sustainable solution. Concentrating on good land husbandry and organic farming can achieve results: Ethiopia is now exporting crops due to better land use. GM (genetically modified) crops

could be part of the solution in certain circumstances, such as dealing with problems of drought and salinity. GM is politically difficult in Europe, but increasingly accepted elsewhere. However, many maintain that the solution lies in using existing crop varieties, small-scale farming and low inputs.

It is important to stress that the issue is not really one of population growth. Global population is expected to stabilise at approximately nine billion around 2050. The world (population 6.7 billion) already produces enough food for 11.5 billion. India is a net exporter of food, yet one third of people live in hunger: it is food distribution and poverty that are the issues (Sharma, 2011). However, the increasing affluence and consequent demand for animal protein in rapidly-growing economies such as China, together with existing high demand in OECD countries, increases the ecological and carbon footprints of food production to unsustainable levels.

According to Fox (2011), world population will peak this century at 9.5 billion in 2075, having reached 9 billion by 2050. The solutions to food wastage related to engineering problems like storage and transport can easily be solved by existing technology, given the right levels of investment.

Growing inequality and financial instability

In the last five years the global financial and economic systems have been in turmoil, worries about future world food production have grown and storms, floods, droughts and social unrest appear in the news media.

In parallel with energy ascent and our increasing access to energy and other resources, has been the inexorable concentration of wealth and power, with the gap between rich and poor, both between and within nations, growing wider.

Our current economy cannot guarantee any kind of stability. Furthermore, we are becoming increasingly aware of the fact that it breeds **social injustice**. The New Economics Foundation has produced reports citing clear evidence that

the share of benefits from global economic growth reaching the poor is actually shrinking over time (Murphy et al, 2006 and 2010). Global poverty is not being addressed; one-fifth of the world's population earns approximately two per cent of global income (Jackson, 2009, p 6).

But the injustices which result from our economic system do not only affect those living in the developing world. In the OECD countries (that is, most of the rich western nations) levels of inequality have risen in the last twenty years, and while the rich have profited even middle-class salaries were (in real terms) stagnant long before the credit crunch (SDC, *ibid*, p 36). And in the UK, since the recession started, it is the poorest who will suffer most under the public service cuts being undertaken. This will compound the deprivation which already exists in pockets of Ceredigion (Winckler, p.57) and employment and pay levels – already very low in the county as a whole (*ibid*, pp 49-56) – are likely to drop.

But even within relatively well-off countries, economic inequality – as was shown in the 2009 book *The Spirit Level* (Wilkinson and Pickett) – breeds social problems ranging from violence to ill-health which affect rich and poor alike. This is backed up by clinical psychologist Oliver James (2007). More unequal societies report higher levels of distress than more equal ones (Jackson, 2009, p 91). So while tackling these crises might be in part a question of responsibility, from a social as well as environmental and energy perspective, it is also just good sense and basic self-preservation for the élites of our society as much as the most socially disadvantaged.

Towards a local solution

It is clear we need to transform the way we do nearly everything to meet these challenges, to make a transition to an age where we can live with less energy, cope with a changing climate, and close the gap between the haves and the have-nots. We need to become resilient to an unknown future.

This is the goal of the Transition Movement.

See www.transitiontowns.org, or the *Transition Handbook* (Hopkins, 2008) in Lampeter library.

We need to do this in a positive way, so that life will be better, rather than harder. And we need to start here and now.

At national and international scales, Governments don't know what to do. The Transition movement thinks it has the beginnings of a plan.

We wouldn't be so arrogant to suggest that we know all the answers, but we believe we have the beginnings of finding local solutions to a whole raft of interconnected challenges – crises that bring with them immense opportunity for transformation.

Nor can we claim that the solutions presented here are 'ours' – they come from a wide range of visions, ideas, pilots and projects.

The Transition model can't offer ready-made solutions: the way to resilience must be led by each community. The Lampeter area has a rich history of self-reliance. *Everyone's* participation in this Transition project will help it to continue that tradition, and make a difference for the future of the whole community.

Transition Pathways is intended to stimulate ideas and discussion to encourage and enable people to contribute to a strategy for local solutions to the challenges of impending crises in energy supply and climate change, as well as the fundamental changes in our economy required to achieve local sustainability.



Photo: Transition Llambed

The “Preparing for Energy Descent” area

The area corresponds to the Wales Spatial Plan “Key Settlement Area” of Lampeter, Ceredigion. This comprises the wards of Lampeter, Llangybi, Llanfihangel Ystrad and Llanwnnen. The reasons for this choice were to enable comparisons with other strategies and documents that use the Spatial Plan approach. Most of what follows in this section is taken from Ceredigion County Council (2006).



Map: the Lampeter Key Settlement (or “Six Towns” area)

Population

The area has a relatively high level of 15 to 24 year age groups due to the presence of HE students at the University (now Trinity - St David’s University). Student numbers have fallen since the mid-1990s.

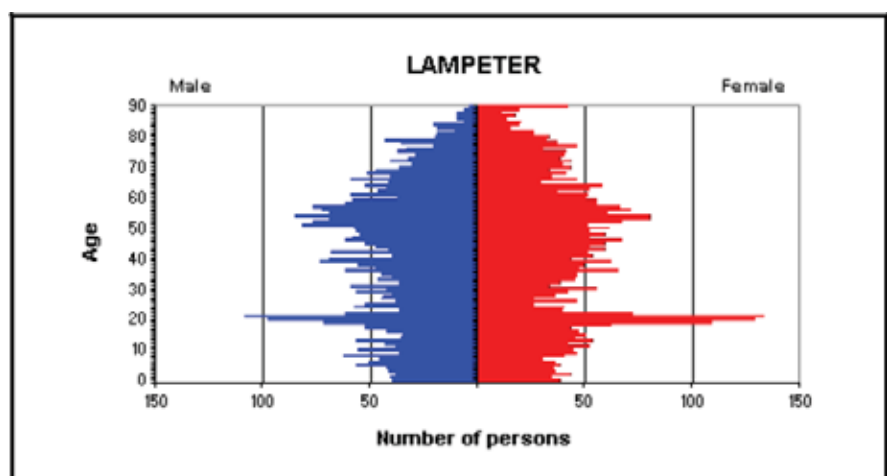


Figure 1. Population Pyramid (Source: CCC, 2006).

The town area maintained its population during depopulation but had fallen to 8,770 by 1971. Since 1971 the population has grown by 51% mainly due to growth in rural areas; the growth of town population is mainly attributable to student numbers.

Lampeter is by far the largest settlement in the area (population 2,900). A group of coalesced hamlets along the A482 at Ystrad Aeron/Felinfach form the only larger village centre; there are also smaller villages with populations of up to 200. The areas to north and south of the Teifi comprise scattered hamlets linked by minor roads but these are slightly less dispersed than, for example, the Aberaeron or Llandysul areas.

Lampeter has the main concentration of general retail and service functions, including supermarkets, general retail, secondary school, leisure centre, health clinics. Some administrative functions; and there is a small industrial estate on outside of the town.

The main distinguishing function is the university which accounts for some provision of services.

Economic activity

Overall level of economic activity in the area is lower than county average (55.9% of 16 to 74 age group) due to the HE student effect. At ward level Lampeter is significantly below the county average due to HE students; other ward areas are above county average.

In the 2001 Census, the employed resident workforce was around 3,400 (12% of county workforce).

The area is second only to Tregaron as an area with relatively high employment in agriculture (“primary” employment of 14.9% of those employed). Otherwise it is close to county average, with noticeably a higher proportion in education than in other areas except Aberystwyth.

Transport links

Main links are along the A482 north to Aberaeron and south to Tywi valley, and west

Other villages have fairly limited local functions except for Felinfach/Ystrad Aeron which is the location of a small industrial estate and facilities on the Felinfach campus.

The Lampeter area is part of the larger Aberaeron/Lampeter travel-to-work area. This reflects the existence of an area between the major Aberystwyth and Cardigan functional areas for employment or housing markets based around the Aberaeron to Lampeter axis.

However, overall the area’s self-containment is fairly weak and results from relative distance from other major centres rather than intrinsic functions, and so it must be expected that substantial links and dependencies exist, especially with Aberystwyth and with other towns including Carmarthen.

Lampeter town forms the local centre for a large area of the middle Teifi valley including areas in Carmarthenshire.

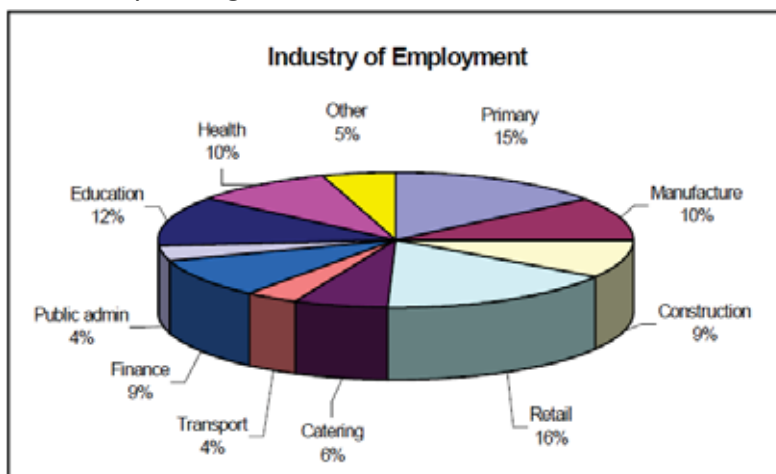


Figure 2. Industry of Employment (Source: CCC, 2006)

along A475 to Cardigan; and via A485 west along south side of the Teifi valley to Carmarthen and east to Tregaron; Aberystwyth can be reached by A roads or by the B4337;

secondary and minor roads form a network on the north side of the Teifi but this is relatively thinner than in some areas.

Health

Overall the Lampeter area has a lower level of **permanent sickness and disability** (7.8% of 16 to 74 age group) than other areas except Aberystwyth. At ward level Lampeter and Llanwennog are below county average, but Llangybi (8.5%) and Llanfihangel Ystrad (9.3%) are above county average and in the worst 10 wards for Ceredigion.

Reported lower **limiting long-term illness** (21%) than any area except Aberystwyth, presumably affected by the HE students factor. At ward level only, Llangybi has higher than county average reporting of limiting long-term illness.

In 2001 the area reported higher 'Good' health (68%) than any area except Aberystwyth. Lampeter ward has the lowest reporting of good health (64.1%).

Welsh Language

The overall area proportion of Welsh speakers (57.8%) is higher than the county average.

Older people

There are notably higher levels of more elderly lone pensioner households in Lampeter town. In this ward there is a relatively high proportion of all-pensioner households without access to a car.

None of the Lampeter area wards appear in the worst quartile for the proportion of pensioner households without central heating.

Economic priorities and deprivation

Some of the challenges to Ceredigion's development are summarised by Winckler, (2009) as follows: *Ceredigion's idyllic image is belied by some emerging challenges about employment, pay and incomes and housing. These challenges could jeopardise Ceredigion's future development.*

Ceredigion has very high levels of economic inactivity which are not wholly explained by its student population or its population of the early retired. These high rates mean a loss of potential to the economy.

Ceredigion's rates of pay are well below average, both for weekly and hourly pay. The gap appears to be greatest at the top of the income distribution.

Claims for almost all kinds of benefit are below average, but the reasons for the low levels of claims are not clear. Nevertheless more than 1 in 10 of the population relies on some form of benefit for all or a substantial part of their income.

There is an acute problem of access to affordable housing, especially for first-time buyers, and also a shortage of social housing.

There are pockets of deprivation within Ceredigion, and the relative position of a number of wards appears to be deteriorating.

As well as mainstream economic development, there is potential to develop new approaches that take account of the emerging challenges.

Promising approaches include:

prioritising job creation

helping people into jobs

maximising incomes / minimising costs

community action.

These solutions need to be 'made in Ceredigion' and developed with local partners if they are to meet the county's specific needs.

Looking back – a snapshot of self-reliance

The following suggests that parts of Ceredigion have been self-reliant in recent history¹, and if necessary could be so again, depending on the population. Towards the end of the 19th century, population reached a peak of 73,000 in 1871 after which it declined to 53,000 in 1951 (CCC, 2011), before rising again to the current level (77,200 in 2006 according to ONS² estimates).

The area was as a whole more or less self-sufficient until well into the twentieth century, with the exceptions of sugar, tea, iron and paraffin. The majority produced enough food for themselves on smallholdings until the population massively flooded to South Wales for work in the coalmines (Leech, personal communication, July 2010).

Even those living on the upland settlements were able to sustain themselves, albeit with difficulty. There were many general shortages. Yet they took advantage of every aspect of the raw materials available to them: 'stones for construction from the fields, clods of earth for the roof and later thatch, peat, trees for wood, streams and springs for water and rabbits for food (p 46)

What is more, the sense of community led to a powerful local economy. Farms were all intrinsically interlinked, and helped each other. They provided bulls for breeding, undertook mass shearings communally and made hay together. And the inhabitants constructed their own footpaths between individual farms. (p 46, 107).

Services grew and thrived until the drift to urban centres commenced. This involved the creation of shops, schools and public houses. It was not until the late nineteenth century that people began to retreat from the hills, as the manufacturing economy developed in urban settlements all over Britain. (p 46). The loss of

farm labour in this way was offset by more efficient farming methods and equipment. (CCC, 2011)

Today there is already a community of those who wish to live more sustainably and are enthusiastic about the rustic setting. Many of these stem from the influx of those seeking alternative lifestyles from England, who today undertake such jobs as running B&Bs, writing and working from home via the internet (p 46).

We should not romanticise the past, however. Life was hard and there was without a doubt a fair amount of strife between inhabitants of the communities. This was, though, principally between tenants and land owners (p 1).

The key point here is that the population today is only about 5% higher than the 1870s when the area was to a large extent self-sufficient. This gives some encouragement to those in the Transition movement who believe a return to greater self-reliance will be required. However, it should be remembered that the structure of the population today is very different compared to the 19th century. Apart from distortions due to the number of students in Lampeter, the population is ageing; this is hardly ideal if a return to the land is required to achieve local food security on minimal oil inputs.

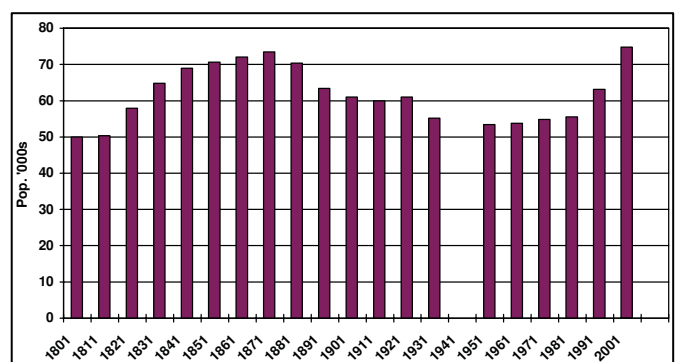


Figure 3. Ceredigion population 1801-2001 (Source: Thorburn, 2004)

¹ Except where indicated otherwise, this section is taken from Leech et al (2009); page numbers refer to that work.

² ONS – Office for National Statistics

Lampeter area’s Ecological Footprint

The Ecological Footprint is an “indicator of the total environmental burden we place on the planet ... it represents the area of land needed to provide raw materials, energy and food, as well as absorb pollution and wastes created” (Stockholm Environment Institute (SEI), 2008). The footprint is measured in “global hectares” (gha), to indicate the area of land required to support a population. Ceredigion’s footprint is

approaching 5 gha *per capita*. On a global scale, if everyone in the world lived the lifestyle of the average resident of Ceredigion, we would need three earth-like planets to support us. To achieve global sustainability and equality, we must reduce our footprint to the global “fair share” of less than 2 gha *per capita*.

The SEI’s 2006 assessment of Ceredigion’s footprint is as follows:

	Ecological Footprint (gha/capita)	Carbon Footprint (tonnes CO ₂ /capita)	GHG Footprint (tonnes CO ₂ eq/capita)
Housing	1.06	3.45	3.86
Transport	1.00	3.63	4.22
Food	1.24	1.13	2.68
Consumer Items	0.58	1.15	1.75
Private Services	0.26	0.77	1.09
Public Services	0.51	1.61	2.20
Capital Investment	0.09	0.31	0.39
Other	-0.01	0.07	0.06
TOTAL	4.73	12.12	16.26

Table 1 Ceredigion: Per Capita Footprint (Source: SEI 2006)

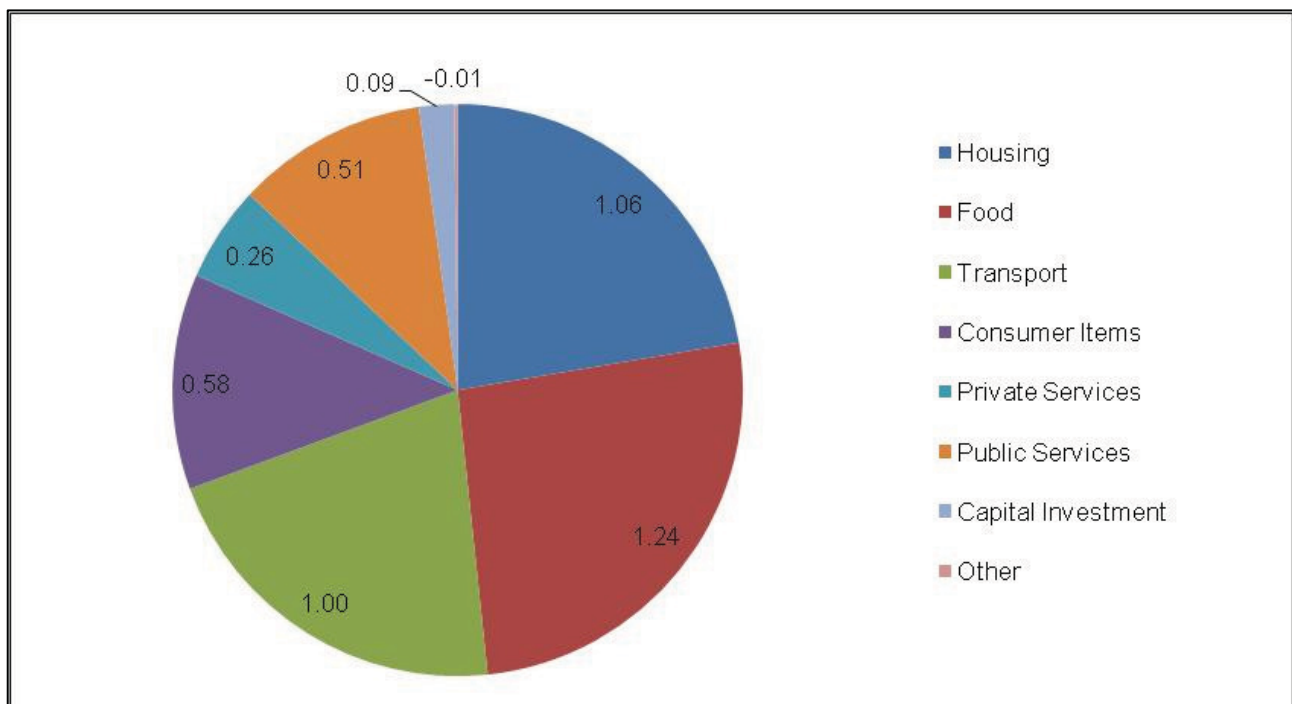


Figure 4. Ceredigion Per Capita Ecological Footprint 2006 (gha) (Source: SEI 2006)

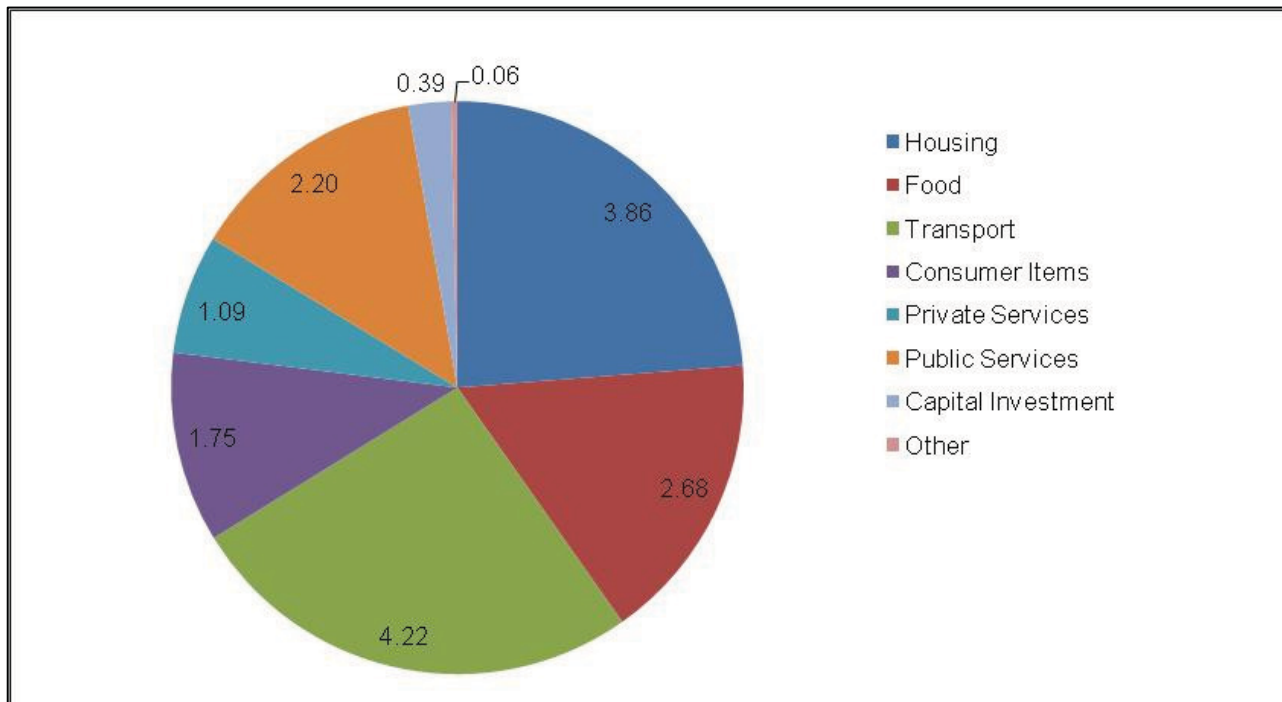


Figure 5. Ceredigion Per Capita GHG Footprint 2006 (tonnes CO₂eq) (Source: SEI 2006)

A series of energy efficiency and ecological footprinting surgeries carried out by the project team in the Lampeter area showed a very similar average total footprint per person as the SEI results above. However there was great variation between the lower and higher footprints.

The surgeries used *Reap Petite*³ software, “the community footprint calculator”, developed by SEI to help communities calculate their ecological or carbon footprint and test the effectiveness of a number of footprint reducing pledges. It is designed specifically for use by, or with, community groups.

The sample of 50 people was not representative of the population of the area (for example, a large proportion were in the 40-59 age group, more than the proportion expected from ONS statistics). However the results are useful in demonstrating some general points about footprints and highlighting the wide variation between lower and upper footprints.

The lowest footprint was 2.79 gha, and the highest 8.32 gha. The most notable factors that affected the total footprints were:

The amounts of meat products consumed, demonstrating how food, particularly livestock products, is a major contribution to environmental and climate change impacts.

Travel habits, with dramatic increases in the footprint shown by those who fly, even if only occasionally, particularly if they take long-haul flights. The distances travelled by car also had major influences on the footprint.

To a lesser degree, the footprint was also influenced strongly by home energy efficiency, type of heating fuel and the amount of consumer items bought by interviewees.

³ <http://www.resource-accounting.org.uk/reap-petite>

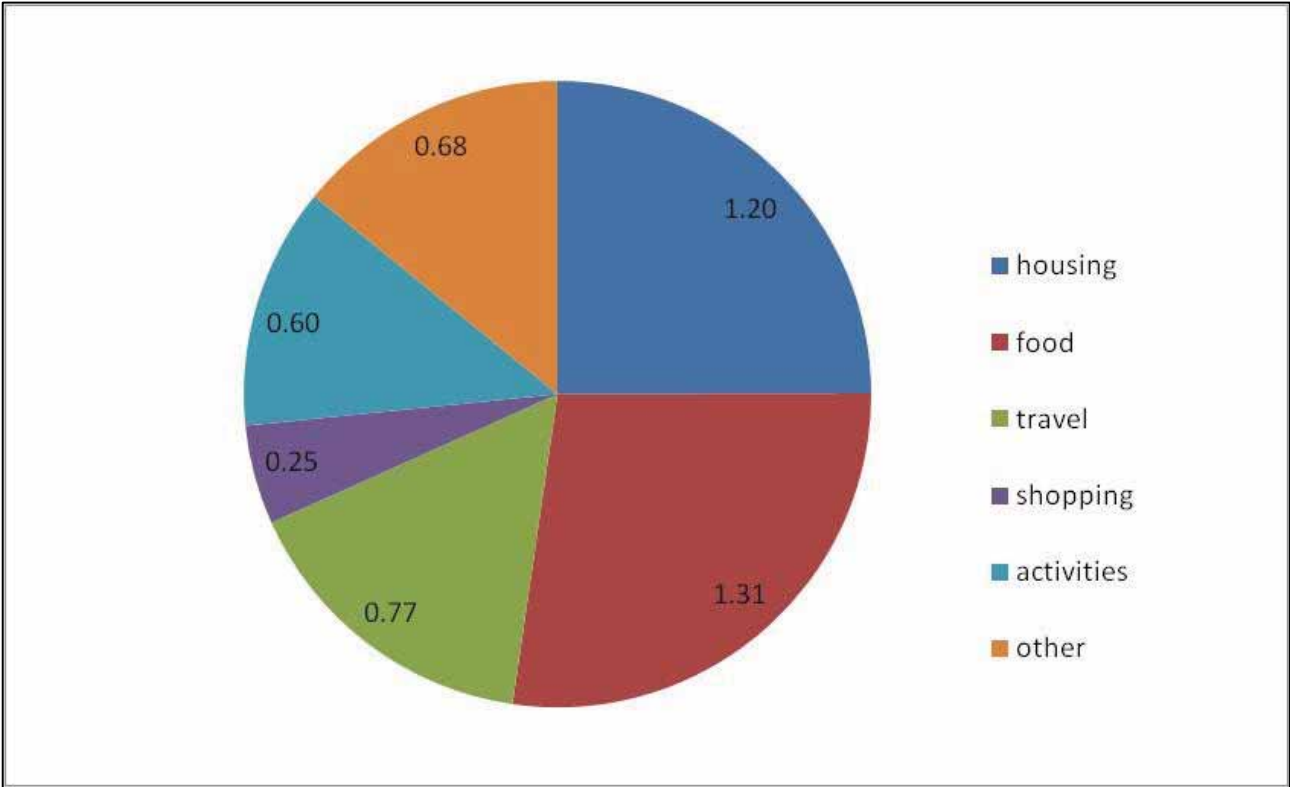


Figure 6. Lampeter Area Per Capita Ecological Footprint 2006 (gha)

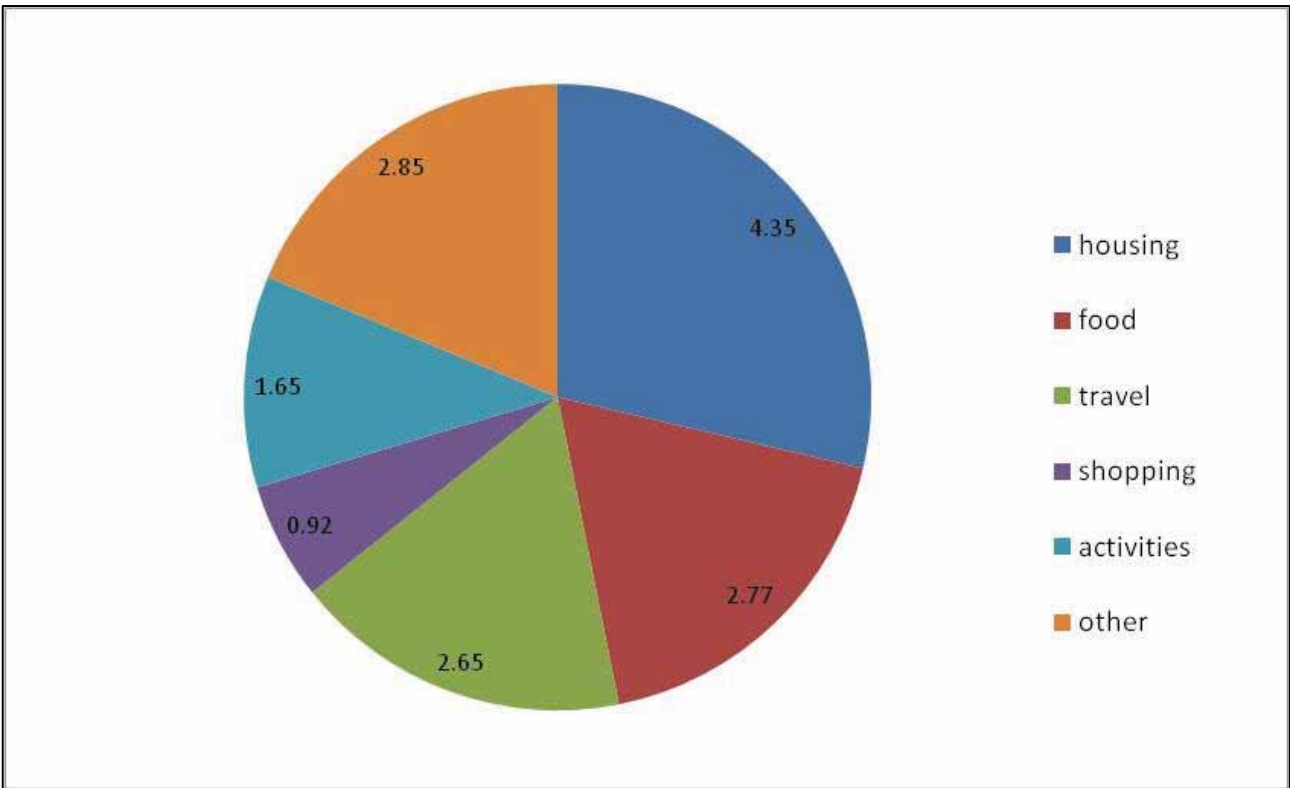


Figure 7. Lampeter Area Per Capita Carbon Footprint 2006 (tonnes CO₂eq)

Future scenarios

We have attempted here to combine scenarios from two very different sources; from the Carnegie UK Trust (2007) and *Future Scenarios* by David Holmgren (2009). They are not intended to predict the future, just to help us imagine some of the possibilities for 2030 given current trends.

Why use scenarios?

By trying to combine the effects of different trends that, at least in medium-term timescales are more or less independent of each other, we can to some extent concentrate on the things we can change locally (like what should be the focus of an energy efficiency campaign) without being distracted by things that we can't have a significant direct influence on (like global climate change or oil prices). Scenarios can be used to develop stories about the future that can help us become adaptable and resilient to an uncertain future.

We can build local resilience no matter where we live, at the same time as we make the greatest contribution to reducing greenhouse gas emissions (Holmgren, p. 57).

It is possible that a number of scenarios could be in play at different levels (from national to community), at different times and in different places. Here we have considered a future where the UK develops along the lines of the **Us-and-Them** scenario (see Table 2), while Wales and Ceredigion are more akin to **Green Compact**. Assuming the local Transition movement continues, we may see the Lampeter area as going down the road of **Local Stewards**, perhaps with some isolated small communities developing more like the **Lifeboats** scenario.

These 'nested' scenarios (as Holmgren calls them) seem quite plausible looking at current trends.

There are already signs: at national UK level, while investment in renewables is growing, there seems to be a tendency towards "Us-and-Them", accelerated perhaps by financial instability and budget cuts, and internationally

by desperate measures to extract difficult fossil fuels like oil sands. In many ways the opportunity for a 'green new deal' in the wake of the financial crisis have been missed, with little spending on stimulating low-carbon technology or re-skilling the workforce (CAT, 2010, 333). Interest in 'clean coal', nuclear and securing fossil fuel supplies seem to be the defining factors of UK energy policy (e.g., Huhne, 2010).

Regionally and locally – Wales and Ceredigion – there are clear attempts at planning for Green Compact. This is reflected not only in pushes for sustainable energy strategies and promotion of local food, but also in health and social strategies

Does this mean then that the Lampeter transition strategy should be one of Local Stewardship?

Undoubtedly there are households and small communities that resemble the lifeboats approach.

Future Scenarios	Us-and-Them	Green Compact	Local Stewards	Lifeboats
Economy	Globalisation is forced in to a corner by protectionism as nations try to secure energy and resource supplies and cope with financial crises. Locally, shortages in goods and services are critical.	Globalisation continues, based on 'sustainable' models of economic growth, as 'cradle-to-cradle' production is adopted increasingly by large corporations. Ethical and niche local goods are increasingly valued.	Balance has shifted to more local economic bases, with shorter supply chains and more being produced and bought locally.	Small pockets of knowledge-driven and economically self-sufficient homesteads/communities. IT contributes significantly for the delivery of services.
Politics	There is a disconnect between central government, large corporations and local communities, sometimes leading to strong regional or local identities. International co-operation is weak.	Continued decentralisation of power in UK, at the same time as strengthening of international alliances and frameworks to address global economic and environmental problems. Ethics and social justice are increasingly important due to influence of civil society.	The political focus has shifted to a more local level, with greater local control of budgets. There is tension between the EU, national government and local communities	Political culture is decentralised, stronger and more accountable; the world of online discussion feeds into the public decision process
Diversity	Conflicts between and within some communities around ethnicity and competition for resources, though others are able to build united communities around common goals. Differentials in the impacts of climate change cause further inequality and climate refugees.	Gap between rich and poor reduced to some degree, but extensive use of economic migrants to address labour shortages is often a problem. Resistance in some groups to reduction of consumption can be a cause of conflict.	Diversity plays out differently in different communities, depending on their cultural history, prevailing social attitudes, and the values of the organisations which provide leadership in a given locality	Virtual online 'cluster' around interests of particular diversity groups. Digital exclusion becomes a major source of inequality, restricting access to services and work.
Resources	Gradual decline in energy supply is not generally matched by increase in non-fossil fuel energy sources as nations focus on securing dwindling supplies. Sustainable resource use is largely promoted by younger people and isolated regions.	Manageable decline in fossil fuel supplies is increasingly compensated by increase in renewables, and in many nations nuclear power. Shift to sustainable, energy-efficient production combined with greater reliance on renewable resources and biomimicry in design.	Resource reduction is managed principally at a local level. Central funds can be bid for to support investment projects which help to achieve this	IT is key to small-scale local energy distribution. Issues around amount of power used by the virtual world; only the energy rich able to participate fully.

Table 2 Future Scenarios

Visions of a better future: Lampeter area in 2030

The vision presented here has come from visioning exercises and consultations carried out by Transition Llambod.

How much of it is your vision?

The town of Lampeter and its environs have been undergoing what the locals are calling a 'quiet revolution' for the past decade and a half. Much work has been done, though there is much still to be achieved. It's becoming increasingly apparent that Transition is a continuous process which will last longer than the lifespan of the individuals which are collectively steering it – and that this is a fact to be celebrated. Once the movement had entered mainstream consciousness – and was clearly here to stay – there was a brief debate on its exact origins. Was it more due to our local initiative, the success of other Transition Town models, or apparently external environmental and economic pressures? It was quickly accepted, however, that all such factors were intertwined to such a degree as to make the argument meaningless; and, moreover, this was energy which could more usefully be channelled into consolidating the achievements made so far, on all scales – in the community and region and outwards towards the global.

In Lampeter, the sense of community is unique and pervasive. While communal projects at first brought social tensions to the fore – between Welsh-speakers and those seen as relative 'newcomers' to the area as well as faith groups, Welsh nationalists and environmentalists – this has developed in an organic way into a single broad and relatively inclusive society. The old divide between Welsh and English speakers is disappearing, as community Welsh courses rocket in popularity and the first generations to receive a fully bilingual education are now approaching working age. The use of both languages in everyday life is becoming the norm, with people switching between the two so frequently as to suggest the beginnings of a rich and highly localised dialect which allows for greater communication with Ceredigion and the rest of Wales.

The town centre plays host to many events which were once set up with the open intention of encouraging inclusivity, but which are now meaningful activities in themselves, such as discussion evenings, reading groups, clothes, household goods and seed swaps, food fairs, film nights and communication workshops.

Much of this activity is centred on the Victoria Hall, generously leased by the progressive County Council to Transition Llambod as a focus in the early years of the transition movement. This has been complemented by a greater appreciation of the area's countryside, and there are regular rambles and conservation workshops, as well as popular shared transport initiatives as a means of getting around the wider area. The countryside seems to have in a sense moved into the town, too, as personal allotments and community garden sharing have become popular. The social and the environmental are therefore twin concerns for the people of the Lampeter area – and they always have been.

These activities, though, are not just pleasurable: they have also been spurred on by necessities stemming from global pressures. The increasing scarcity of resources as peak oil looms, and the sense of responsibility demanded by increasingly violent symptoms of global climate change, means that more and more people are 'feeling the pinch' in a fiscal as well as moral sense. It's becoming clear that there are no cheap or easy 'fixes' to be found, and the individual's economic as well as social choices are increasingly politicised as a result.

Necessity, though, is the mother of invention, in a broad and meaningful sense. It wouldn't be much of an exaggeration to say that a new social consciousness is in development. It is manifested not just in the community spirit, but also in the way that people spend their money.

Apart from supermarkets – which are becoming culturally undesirable as well as practically redundant as quickly as they had once become (supposedly) needed – Lampeter had never

boasted many chain stores, and this apparent lack is now a source of great pride in our community. Of course, some businesses have suffered under greater global economic pressures but those which have been able to adapt to acquiring resources in an environmentally responsible as well as economically thrifty way have flourished, and have acquired dedicated local support. The countryside, too, has shifted into the town in increasingly conspicuous ways. The farmers' market is now an almost daily occurrence, and is held in the Victoria Hall.

There are still energy shortages – the area is still in part externally dependent in this respect, and we're slowly recognising the fact that more radical steps will have to be taken on an individual as well as community level. However, the frequent and extended power cuts and fuel shortages experienced in the second half of the last decade are becoming less of a problem as more local micro-generation schemes come on stream, and people learn to adapt to low-energy lifestyles. What's more, researchers at the University of Trinity St David are dedicating more and more of their time to this issue. Yet the people of the Lampeter area have already made impressive steps in the right direction, and the 'great reskilling' is gaining momentum

One potential threat is parochialism. There is still something of a 'digital divide' in the area – the phenomenon of technological 'have-nots' is still around, and this problem is particularly common in the countryside. Given that distance travel is less common, the internet in particular has become a vital means of feeling connected with those outside of our immediate community.

However, there are efforts being made to extend the town's wireless network to the area as a whole – 'not-spots' in deep rural areas have mostly been addressed through community-owned fibre optic networks – and it would be wrong to say that the people of Lampeter are not interested in more 'global' concerns. The now-powerful Fairtrade movement has found its foothold here. While the original drivers of the movement were drawn from faith groups as well as green activists, the people of Lampeter

as a whole share a passion for social justice on a scale which transcends the local. Our motivation is bolstered by a burdensome sense of national guilt, as the divide between rich and poor nations still exists – and it's the poorest nations which continue to suffer the worst of the fallout from climate change.

It would be wrong to paint a perfect picture of the Lampeter area today. But there is the general consensus that while environmental and economic concerns have forced a change in everyday life, this has been a change for the better.

It's not entirely clear what tomorrow will bring, but we, the people of Lampeter, are readier than ever to face it – we are more socially connected, healthier and happier. And we aren't waiting for changes on the world stage to push through meaningful reform in our community. Suddenly it seems less a case of passive adaptation and more an opportunity for active creation; and it becomes clear that what happens in the local has repercussions for the regional, the national and even the global. For Lampeter, the path from local to global seems ever smaller.

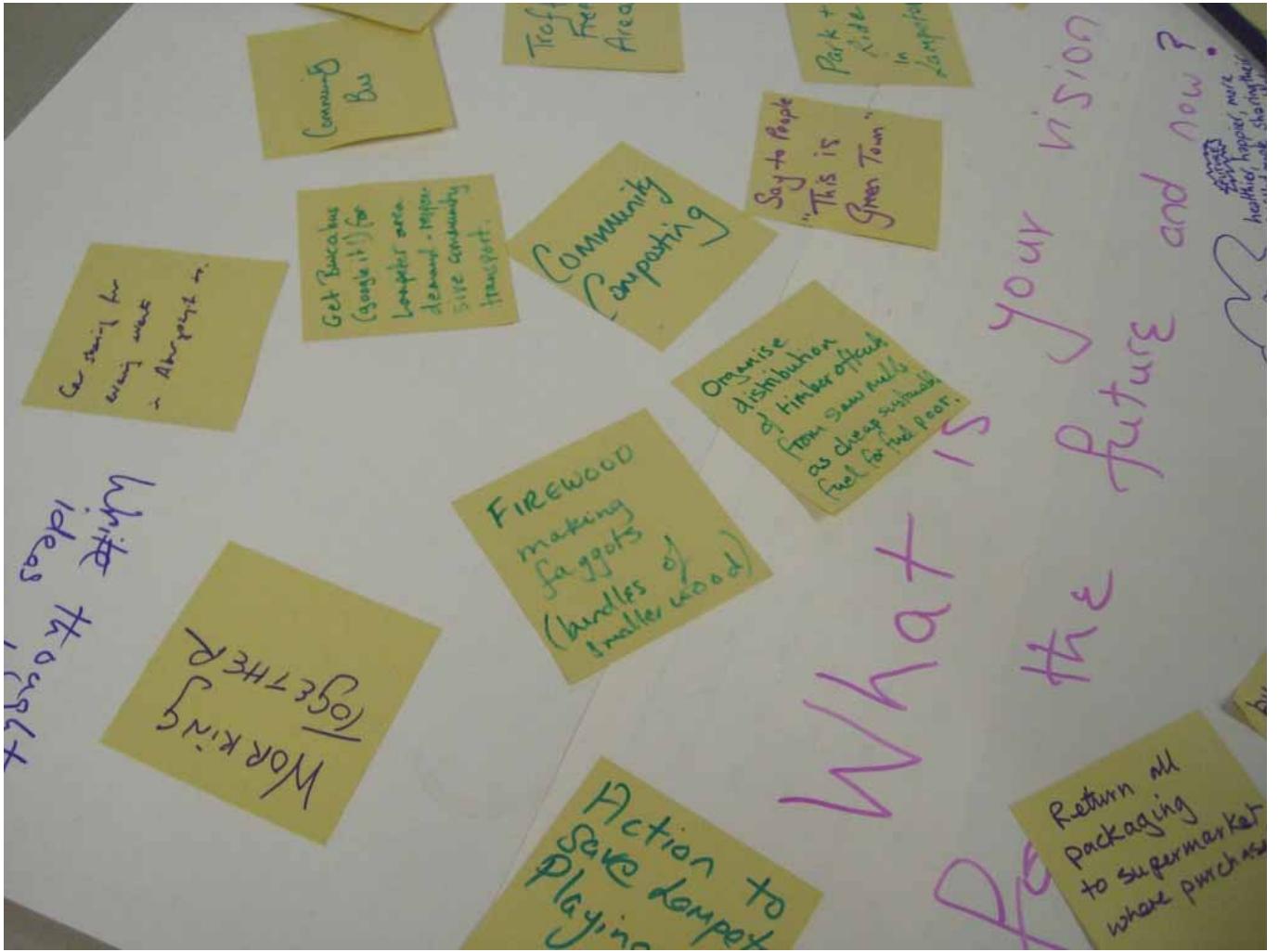


Photo: Transition Llambed

Living in the Lampeter Area: survey results

Two questionnaire surveys were carried out to gauge people's perceptions of the issues around communities, the environment, peak oil and climate change. One, known as the "general survey", was open to anyone to complete and was available at all events held by Transition Llambled during the project, on the website and at other opportunities. The other was a survey of a randomised sample of addresses in the project area, and was carried out by post, referred to as the "random survey": this was intended to ensure a representative cross-section of the population of the area.

The results of both surveys should be considered with caution for a number of reasons. The sample sizes were much smaller than originally intended, largely because of the difficulty in finding volunteers to conduct interviews in the case of the random survey, and to distribute questionnaires in the general survey. The general survey sample was 86 (originally intended to be at least 400), and that of the random survey 22 (originally intended to be 70). Both surveys had elements of "self-selection". Since most of the respondents to the general survey had come to transition events or visited the website, it is likely that the majority were already interested in the issues. The method of carrying out the random survey, by post rather than the originally envisaged face-to-face interview, meant that people had to make more effort to respond, again making it more likely that only people who felt strongly about the issues would be likely to return the questionnaire.

These difficulties mean that neither survey can be regarded as representative of the whole population of the project area, however it is still worth considering the results, particularly by comparing the results of the two surveys.

Q1: Had you heard of the following groups or organisations (Transition Llambled/Menter Llambled/Ymlaen Ceredigion) before we contacted you?

In both surveys the same proportion had heard of Menter Llambled (59% of each sample), fewer had heard of Ymlaen Ceredigion. In the general survey, 76% had heard of Transition Llambled, in the random survey this was 32%.

*Q2: Would you say you are an active member of the community, for example, do you get involved with community events or groups?
(Yes/No/Don't know)*

Q3: Do you feel that you can make your voice heard in the way your local community develops? (Yes/No/Don't know)

Not surprisingly both groups showed that being active members of the community tended to make them more likely to feel that they could make their voices heard. However the random survey group appeared to be less engaged, or more excluded, than those in the general survey. For example, in the random survey, of those that considered themselves active members of the community (32%) 43% felt they could make their voice heard. Whereas in the general survey, 77% felt they were active members of the community, of whom 62% felt they could make their voice heard.

Q4.1: What are the things that are best about your community now?

*Q4.2: What things would you like to see in your community, but aren't there at the moment.
(Community spirit/Proximity to friends or family/Housing quality/Access to public transport/Education & training/Employment opportunities/Opportunities to use the Welsh language/Access to health services/Opportunities to buy locally produced food/Opportunities for leisure activities/Services for people with disabilities).*

The results to these two show broadly similar patterns for both survey groups. In both, community spirit is felt to be important at the moment, as is the opportunity to buy local food. In both, access to public transport and employment opportunities rank highly as areas that people would wish to be improved. In the random group, for Q4.1, community spirit was a

little less important than the case in the general survey group, but proximity to friends and family was more important.

Q5: Do you have a corner/village shop (within 1 mile of home)? (Yes/No/Don't know).

Answers to this question were very similar in both groups, with a little over half having such a shop nearby.

Q6: What proportion of your food shopping do you do in the following types of shops? (None at all/A little/Most or all. Corner or village shop (within 1 mile)/ Local independent shops/ Supermarket(s)/ Internet shopping/ Farm shop(s)/ Veg box scheme, food coop, etc/ Other).

Both survey groups showed broadly similar results, with perhaps a tendency to use "corner or village shops (within 1 mile)" less and supermarkets more in the random survey group. In both groups 40-50% used local independent shops "a lot". The overall impression is that people use a broad range of food shopping options, patronising most at least "a little". The least used option is the "veg box scheme, food coop food, etc". In questions such as this one, where people are asked to choose between a lot of options, the problem of the small sample size is particularly acute (for example, the 5% result in the random sample for doing "most or all" of food shopping in a "corner or village shop" represents just one person).

Q7: Do you have to travel to work? (Yes/No). If you do travel to work, how many miles do you travel in a typical week?

Similar percentages in both groups said they had to travel to work (42% in the general survey, 45% in the random survey). People in the general survey group appear to travel further to work than those in the random group: 17% of

the former travelled 100 miles or more per week, compared to 9% in the latter group, the maximum distance travelled in the random group was 175 miles, compared to over 500 miles in the general group. However, only 8 people in the random survey gave their mileage, so the results could be an anomaly caused by the small sample size.

Q8: Which three of the following towns do you go to most, for whatever reasons? (Please rank 1-3 in order of most visited first. Lampeter/ Tregaron/ Aberaeron/ Aberystwyth/ Cardigan/ Llandysul/ Carmarthen).

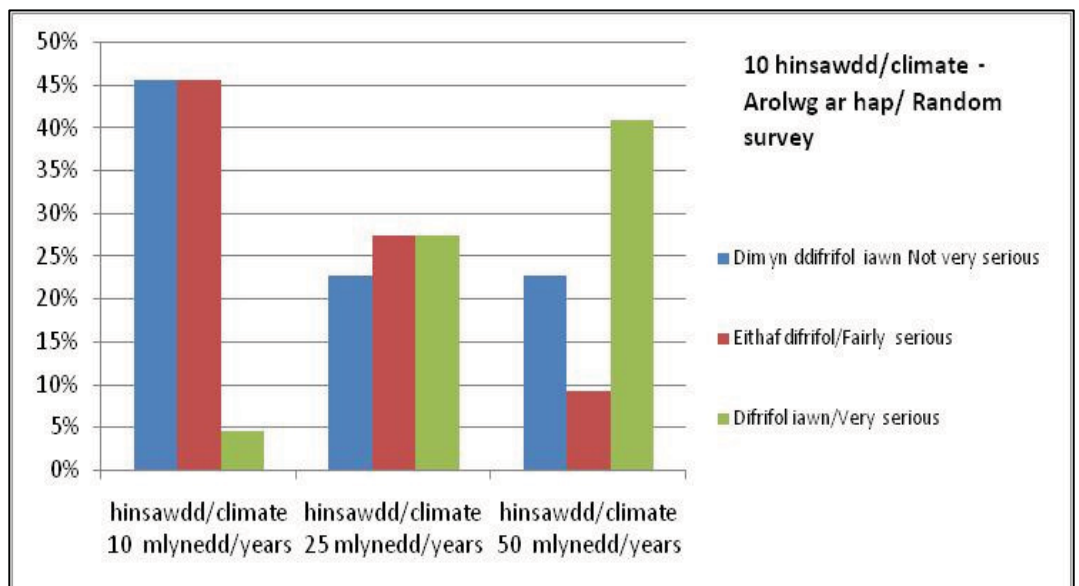
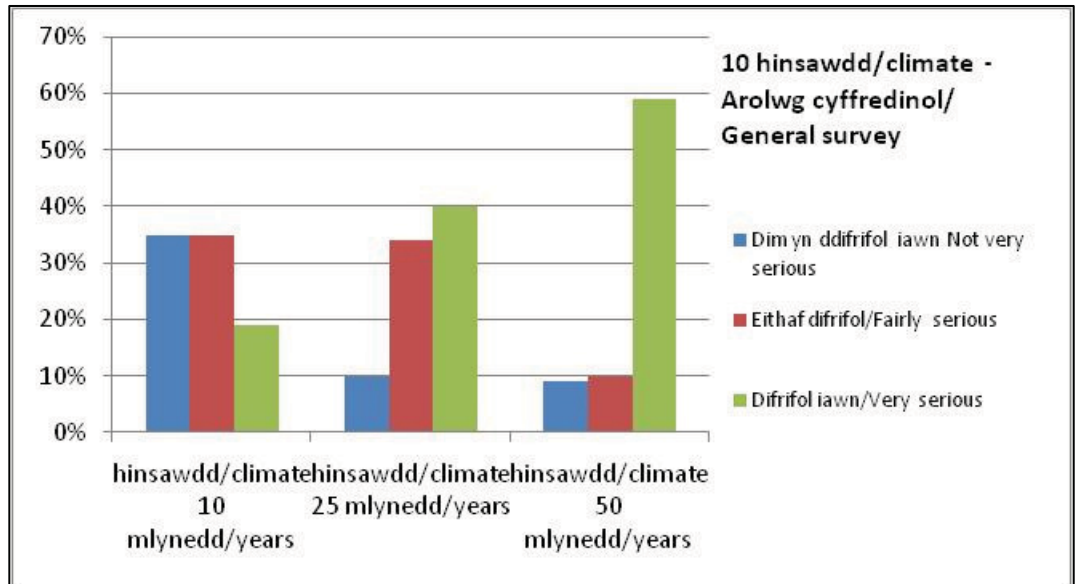
In both surveys, Lampeter is the most frequently visited town, with Aberystwyth and Carmarthen the most frequently the second and third most visited. Looking at the second most frequently visited, there is a broadly similar pattern, except in the general group a higher percentage travel to Carmarthen than in the random group: this could be an anomaly due to the small sample size, but may indicate a different travel pattern.

Q9: If you travel to work, what proportion of your journeys are by the following means? (None at all/A little/Most or all. By car/motor bike/van/ By public transport/ By lift share/ By foot/cycle/ By other means.)

Between 30% and 40% of both survey groups travelled predominantly by car, motorbike or van. However the random group showed more travel by public transport than the general group.

Q10: Do you think climate change will have an effect on you, your family or community in the next 10, 25 and 50 years, and if so, how serious are the effects likely to be? (Not very serious/ Fairly serious/ Very serious).

Greater concern over the local effects of climate change was shown in the general survey than in random group (nearly 60% expected the effect to be “very serious” in 50 years in the former, 41% in the latter). Only one person (5%) in the random survey expected effects to be “very serious” in 10 years, compared to 16 (19%) in the general survey.



Q11: Do you think rising fuel prices will have an effect on you, your family or community in the next 5, 10 and 15 years, and if so, how serious are the effects likely to be? (Not very serious/ Fairly serious/ Very serious).

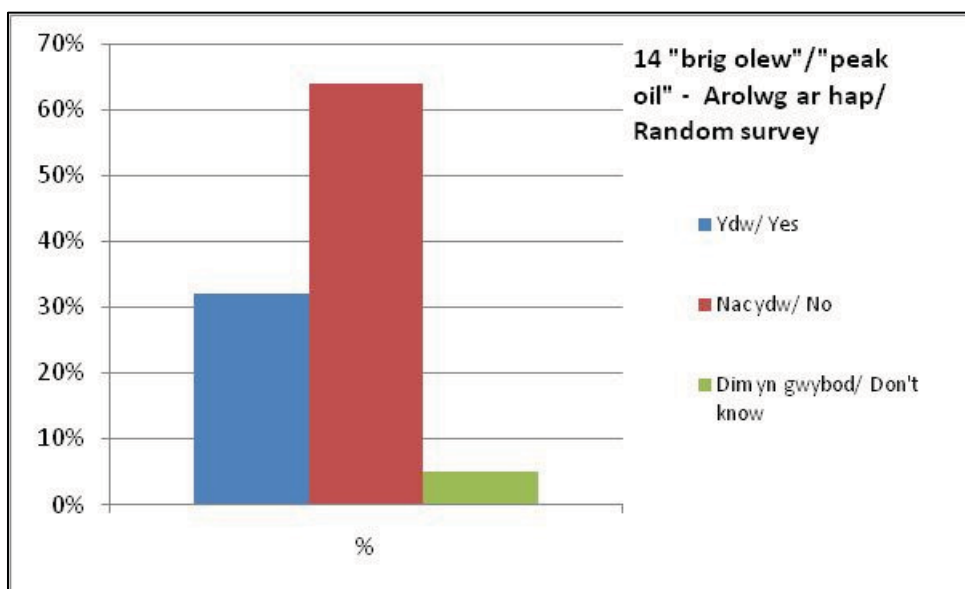
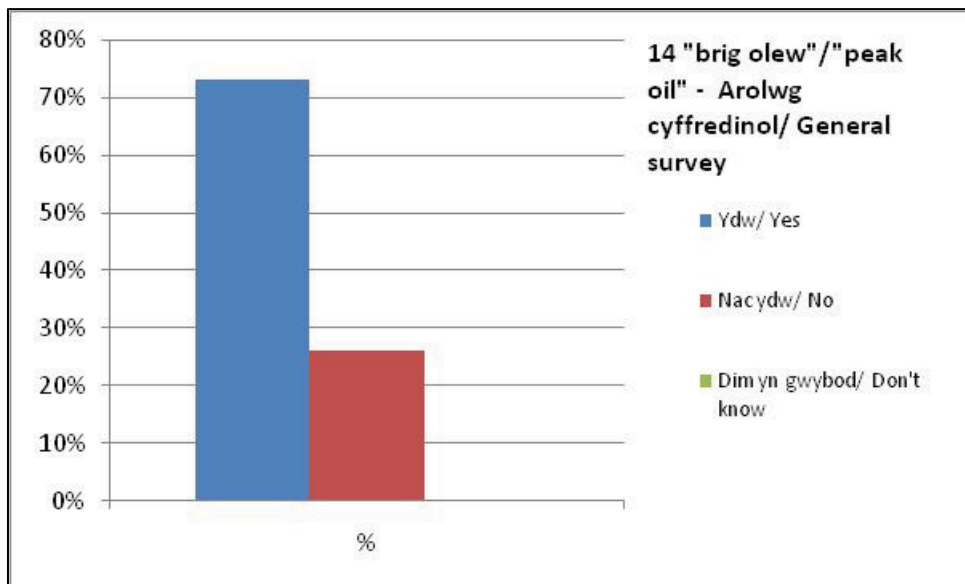
Both groups showed similarly high levels of concern over fuel prices, particularly in 15 years time. There were slightly different patterns between the groups: 35% of the general survey group felt effects would be “very serious” in 5 years, this figure for the random survey was 18%, but if “fairly serious” and “very serious” are added together, similar percentages are shown (80% for general, 86% for random).

Q13: What impacts did the increase in fuel prices in 2008 have on you? (Open question).

Similar effects were felt in both groups, except that 22% of general group said they changed their behaviour in some way, such as growing more of their own food, travelling less, lift-sharing, or changing heating fuel. Some of the responses show the vulnerability to rising energy prices of older people, those with long term illness and those on low incomes.

Q14: Have you heard of the term 'peak oil'? (Yes/No/Don't know).

Approximately a 73%:26% ratio of the general group had heard of peak oil, with the situation reversed in the random group (approximately 32%:64%).



Q15: Do you have any concerns about world oil supplies within the next 10 years?

Concerns over oil supplies were high in both groups (84% in the general survey and 73% in the random).

Q16: How long do you think it will be before petrol reaches £3 per litre? (Please pick the nearest number of years).

Opinions as to when petrol might reach £3 per litre were similar in both groups in the 3 and 5-year time spans, but none in the random survey felt that this price would be reached within 1 year, and a higher percentage of this group said they did not know.

Q17: Do you, or any members of your household, do any of the following? (Reduce the amount of things you buy or throw away/ Reuse things instead of throwing them away/ Recycle things that you no longer use/ Give away things that you no longer need/ Buy second-hand items from charity shops/ Use less energy in the home/ Grow any of your own food/ Compost kitchen or garden waste?).

Results were broadly similar in both groups, with high levels of "pro-environmental" behaviour shown by both. Growing their own food and composting was higher in the general group than in the random, though small percentages of the general group said they did not reduce, reuse, recycle or give away things

they no longer needed, whereas no one in the random group said this. Buying second hand items was a little more prevalent in the general group. The percentage of people saying they use less energy in the home was approximately 70% in each group.

Q18: Please tell us of any other comments, points or questions you would like to raise concerning your community, climate change or fuel prices?

In the general survey, 26 people wrote additional comments, in the random survey, only two. The general survey responses were categorised into seven groups according to the main subjects of the comments, these were: comments about transport (19% of those responding), energy or fuel poverty (23%), waste and recycling (8%), food (4%), more information, guidance or engagement requested (12%), two or more issues (from transport, energy, waste, food, jobs, services) (27%), and comments about either belief or non-belief in human-induced climate change (8%). Note that 4% here represents one person.

Q19 asked for the respondents' contact details.

The remaining questions were intended to give an idea of the social groups responding.

Q20: Ethnicity: would you describe yourself as: White/ Black or Black British/ Mixed/ Chinese or other ethnic groups/ Asian or Asian British?

In both surveys over 90% described themselves as white. 2001 census statistics show 99% of the population of the area describing themselves as white.

Q21: Gender: please tell us whether you are male or female.

In the random sample, 55% were female, in the general survey 64% were female. 2001 census statistics show 51% of the population of the area as female

Q22: How many people live in your household, including yourself?

In both groups, the predominant number in the household was 2 (53% in the general survey, 45% in the random). The random survey showed slightly higher percentages of respondents as

living in single and 3-4 person households, and is very similar to the 2001 census statistics for household size for the area.

Q23: Locality: would you describe yourself as: Born and raised locally/ Continuous local resident/ Relocated within the last 5 years/ Relocated within the last 5 - 10 years/ Relocated 10 years or more?

There are considerable differences between the two groups: 45% of the random survey was born and raised locally, compared to 17% in the general survey, 41% of the former group had moved in to the area, compared to 71% of the latter.

Q24: What is your employment status? (Full time employment/ In school or student (further/higher education)/ Part time employment/ Self-employed In full time training (NOT further/higher education)/ In receipt of incapacity benefit/ Retired (before 65)/ Retired (at 65)/ Registered as disabled/ Not in education/ employment or training)

The results for both groups were similar, except there was a high proportion (30%) of people retired before 65 in the general survey group compared to the random survey (14%). The total percentages of retired people were similar in both surveys (36% and 32%), but much higher than in the 2001 census (14%). It should be noted however that some respondents gave more than one status.

Q25: Age category: please give your approximate age. (Categories: Under 16/ 16-20/ 21-25/ 26-30/ 31-40/ 41-50/ 51-64/ 65-74/ 75 +)

There were quite large differences between the two groups, with 50% of the random survey group giving their age as 65 or over, compared to 25% in the general survey. The general survey also showed a lower percentage of people below 31 years of age than shown in the random survey. Both groups were at considerable variance with 2001 census data, particularly in the older age groups (51 years and over), and the younger age groups (under 21 years).

Q26: Welsh language: would you describe yourself as: Fluent in spoken Welsh/ Learner

(actively taking steps to learn Welsh)/ No Welsh?

There was a marked difference in the Welsh language between the two groups. Of the random survey group, 55% said they were “fluent in spoken Welsh”, compared to 20% in the general group. The 2001 census data showed 58% of people aged 3 and over in the “speaks Welsh” group. In the general survey group 34% were “actively taking steps to learn Welsh”.

Conclusions

The picture that emerges from these results, bearing in mind the caveats of small sample size and self-selection, is of two groups showing different characteristics in certain arrears, such as age profile and levels of engagement, but with similar aspirations with respect to their communities and similar concerns over climate change and peak oil.

The random group seems to feel less included in the way their communities develop, travel less (and are therefore likely to have lower carbon footprints), have an older age structure, a higher percentage of Welsh speakers, more likely to have been born and raised locally, are less concerned about the local effects of climate change, and are more likely to see the threats as medium to long term rather than short term. Both groups value similar aspects of their communities, and would like to see better access to public transport and employment opportunities. Both groups show high levels of “pro-environmental” behaviour, and are similarly concerned about rising fuel prices.

Two very tentative lessons that might be drawn from these results are:

- In raising awareness about transition, put the emphasis on peak oil and fuel prices over climate change.
- Practical projects need to concentrate on the benefits to local communities of transition, particularly through better community and public transport and improved employment opportunities.

Economy

The key to the transformation that needs to take place is the shift from the 'cradle-to-grave' economy and lifestyle to the 'cradle-to-cradle' economy.

The former enshrines consumption in a system that starts with energy-intensive extraction of raw materials and ends with waste on a massive scale. Essentially this system's end product is waste.

The 'cradle-to-cradle' system however is based on a fundamental re-design that mimics the natural cycle in terms of energy and resource use.

Designing out waste: the cradle-to-cradle economy

Powered by renewable energy, waste is designed out of the system; products are made largely from renewable resources that can easily be returned to the system through re-use (or by some form of composting or production of energy).

Where non-renewable resources are used, products are designed for maximum life-span, and at the end of their lives the component parts can be re-used. Recycling is the last resort. This idea is gaining currency in business, with forward-thinking companies using concepts such as "biomimicry" – learning from and applying natural materials and processes - in their design and manufacturing processes. China has embraced cradle-to-cradle in its 5-year plan.

The cradle-to-cradle concept is of course the basis of permaculture, which is increasingly applied to systems beyond agriculture to the sustainability of society and the economy as a whole.

At the root of the crises discussed in the introduction (*Why an Energy Descent Plan?*) is the obsession with economic growth. We live in a society where we're always trying to do more, produce more, consume more. We obviously can't keep on expanding forever – the climate, resources, the environment and the impending lack of oil will soon see to that – but it would be

almost easy to forget this crucial fact, given the way that governments and businesses as well as consumers are acting.

Growth has become the main indicator of progress: Gross Domestic Product (GDP) is the key factor that is used to measure our economic performance. GDP essentially measures the amount of commerce in a particular area. However, it counts expenditure on clearly unsustainable products and services (such as luxury consumer items, air travel etc) as well as remedial action (like clearing up pollution or health service expenditure on curing the results of unhealthy lifestyles) as positive contributions to the economy. Alternative measures of wellbeing, like Gross National Happiness, deduct such costs, and count other non-monetary benefits (such as unpaid work and ecosystem services). It has been demonstrated that, beyond a certain level, rising affluence does not contribute to happiness or well-being. In fact it begins to have harmful effects on individuals and society (James, 2007).

It is the mindset that sees growth in GDP as our main economic goal that has in large part led to the crises we described earlier. The opposite of the path taken for the last few decades – and an antidote to the energy, climate and economic crises – is an economy based on the principle of sustainability.

From a wider economic perspective, there have been proposals that governments could take advantage of the current recession to nudge our society towards sustainability by issuing a 'green stimulus'. This would offer tax cuts and boost public spending, with the emphasis on new projects which reduce energy and material costs, invest in ecological protection, and help create a low-carbon infrastructure (e.g. Jackson, 2009, nef, 2008 and the Environment Agency's Chris Smith, EDIE 2008).

However, the green stimulus plan, while boosting the environmental sector in the short term, would still lead back to a growth-oriented economy if it did not challenge the basic

problem of the overconsumption of resources (Jackson, p 73).

The key to conserving non-renewable resources lies beyond recycling and must aim towards zero waste. Recycling is not an efficient way of conserving resources; it misses 70% of the waste in the materials economy (Webster, p 39) and is relatively energy-intensive. It does not in itself challenge the obsession with growth and consumption. It only achieves production and consumption that is a little more efficient, as well as making us feel better about consuming. Recycling, next to outright disposal, is a 'last resort' practice. Clive Hamilton and Richard Deniss have proposed a 'waste hierarchy' in which there are several superior options: reuse, repair, and reduce (ibid, 39-40).

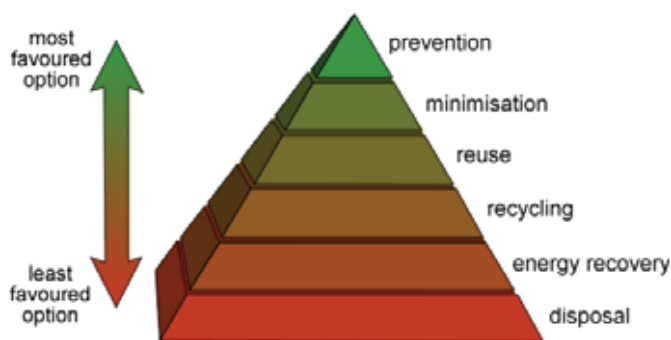


Figure 8. The Waste Hierarchy, source: Drstuey (under *Creative Commons licence*)⁴

Truly sustainable practices take a holistic approach; while allowing for growth in the short term during a period of transition, they reject it in the long run, thus breaking the produce-consume-waste chain that has dominated our society for so long.

The best option of all is 'rethink and redesign'. This means contributing to how or even which products are produced in the first place – surely there is a way to do so in a way that is cleaner, using what would otherwise be wasted, and in a more socially just fashion.

This last suggestion relates well to an economic solution, since for it to be workable it's clear that businesses themselves will have to participate actively. They can do so in part by changing their emphasis from producing goods to providing services – where everything possible is leased or rented: selling 'energy services', rather than energy supplies or 'mobility' rather than cars. It then becomes more profitable for the service provider to supply sustainably than promote as much consumption as possible. In the examples of energy and mobility, it benefits an energy supplier that is contracted to keep a house warm to upgrade the building's energy efficiency, thereby requiring less energy to be supplied to fulfil the contract, thereby making cost savings for the provider. It benefits the mobility provider to supply durable, fuel-efficient vehicles because the provider is contracted to supply a service at an agreed price to the client; the more efficiently this can be done, the more costs are saved. These incentives are also passed on to manufacturers: those that make the most fuel-efficient and reliable cars will have the greater share of the market. Hence the emphasis in the cradle-to-cradle economy will then be on 'long-lasting, upgradeable durables' (ibid p 84).

Manufacturing processes can themselves be redesigned. If we take a 'Nature as Teacher' (ibid p 76) perspective, or biomimicry' perspective, extraordinary steps towards sustainability could be achieved. This new industrial revolution is happening now, and will surely gather momentum as raw material and energy resources grow scarcer and more expensive. Such a shift would imply nothing less than the abolition of the concept of 'waste' as absolutely everything would have its own purpose, its own use.

⁴ <http://en.wikipedia.org/wiki/File:Waste-hierarchy.png>

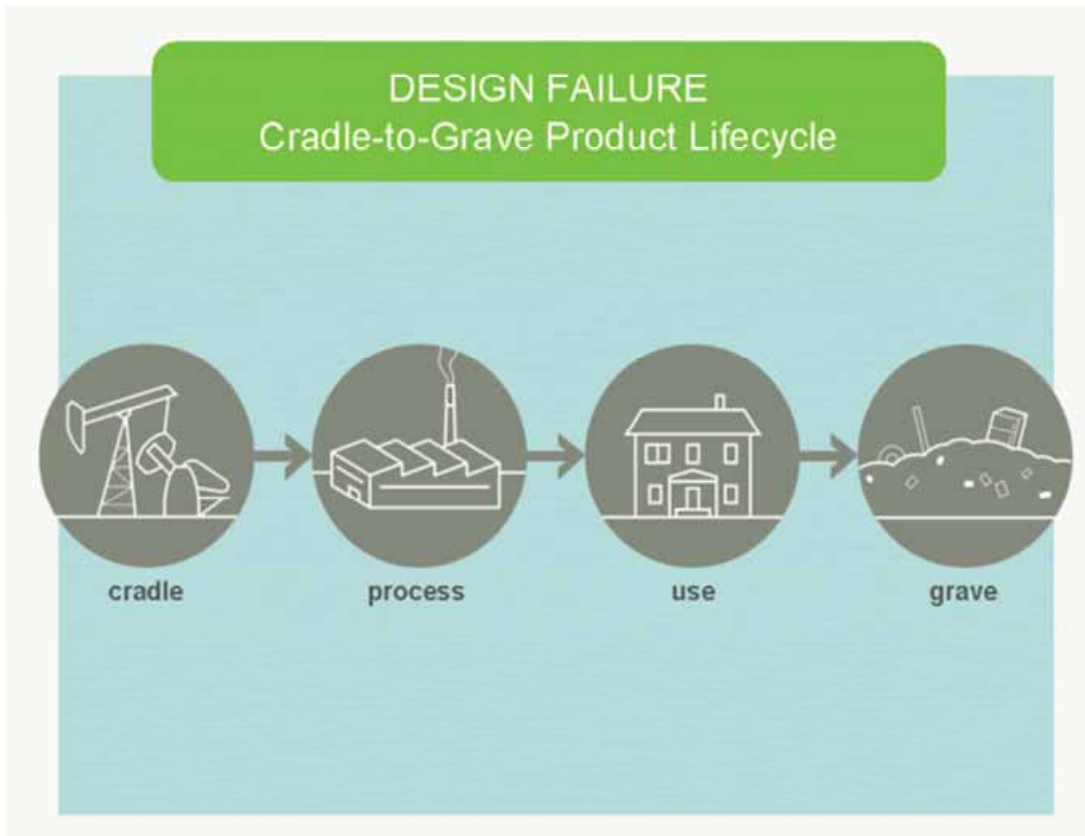


Figure 9. Design Failure

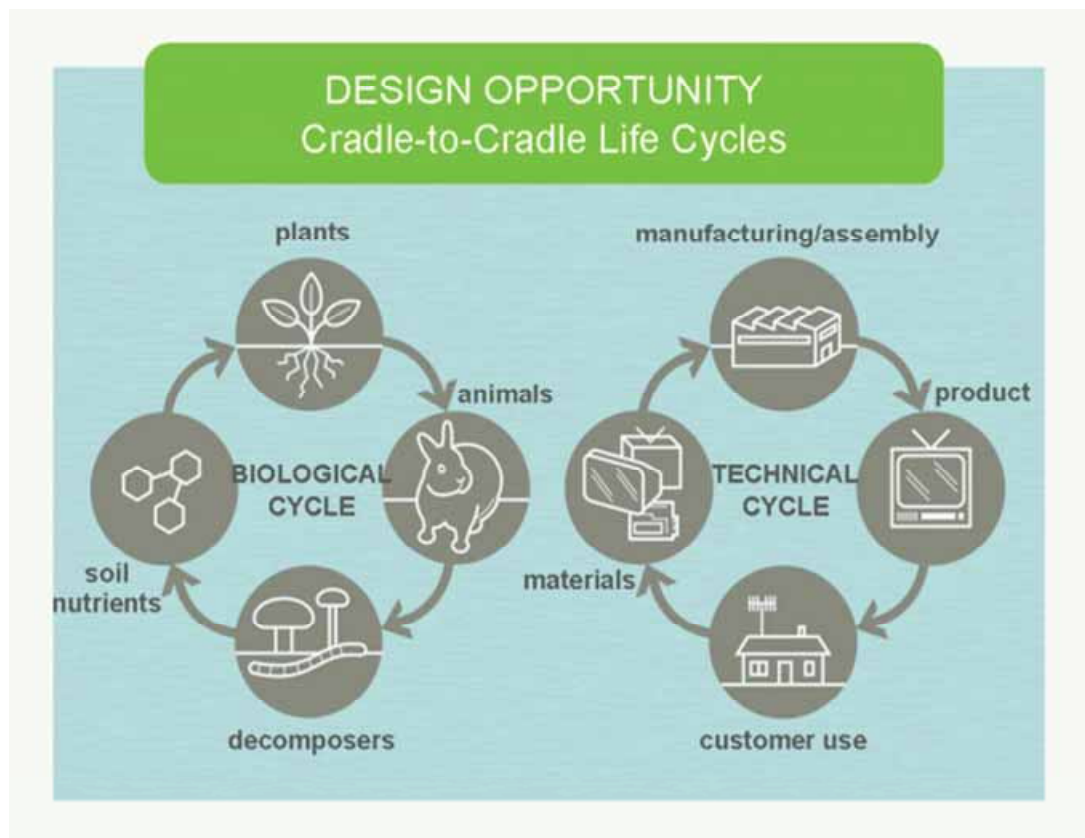


Figure 10. Design Opportunity
(Source: Webster & Johnson (2008))

Building a Sustainable Macro-Economy

Debt-driven materialistic consumption is deeply unsatisfactory as the basis for our macro-economy. The time is now ripe to develop a new macro-economics for sustainability that does not rely for its stability on relentless growth and expanding material throughput. Four specific policy areas are identified to achieve this:

- 1. Developing macro-economic capability*
- 2. Investing in public assets and infrastructures*
- 3. Increasing financial and fiscal prudence*
- 4. Reforming macro-economic accounting*

Protecting Capabilities for Flourishing

The social logic that locks people into materialistic consumerism is extremely powerful, but detrimental ecologically and psychologically. A lasting prosperity can only be achieved by freeing people from this damaging dynamic and providing creative opportunities for people to flourish – within the ecological limits of the planet. Five policy areas

address this challenge.

- 5. Sharing the available work and improving the work-life balance*
- 6. Tackling systemic inequality*
- 7. Measuring capabilities and flourishing*
- 8. Strengthening human and social capital*
- 9. Reversing the culture of consumerism*

Respecting Ecological Limits

The material profligacy of consumer society is depleting natural resources and placing unsustainable burdens on the planet's ecosystems. There is an urgent need to establish clear resource and environmental limits on economic activity and develop policies to achieve them. Three policy suggestions contribute to that task.

- 10. Imposing clearly defined resource/ emissions caps*
- 11. Implementing fiscal reform for sustainability*
- 12. Promoting technology transfer and international ecosystem protection. (Jackson, 2009, p 13)*

These proposed solutions would all go a long way towards tackling climate change and dwindling resources. As we strive to break with cradle-to-grave, we reuse more, consume less, and so produce less, and therefore emit less carbon. And if we can localise these practices we can reduce our dependency on oil for transportation as well as for manufacturing, and also exercise democratic oversight over the whole economic structure so as to reduce social exclusion and inequality.

Community Capital

Similar ideas must be applied to service industries, health and other public services. One way to look at this is to see the resources we have, or our “community capital”, in terms of social, human, financial, natural, built capital etc. To a great extent one resource can be converted into another, enabling, for example, investment in social capital, to pay dividends in improving natural or built capital.

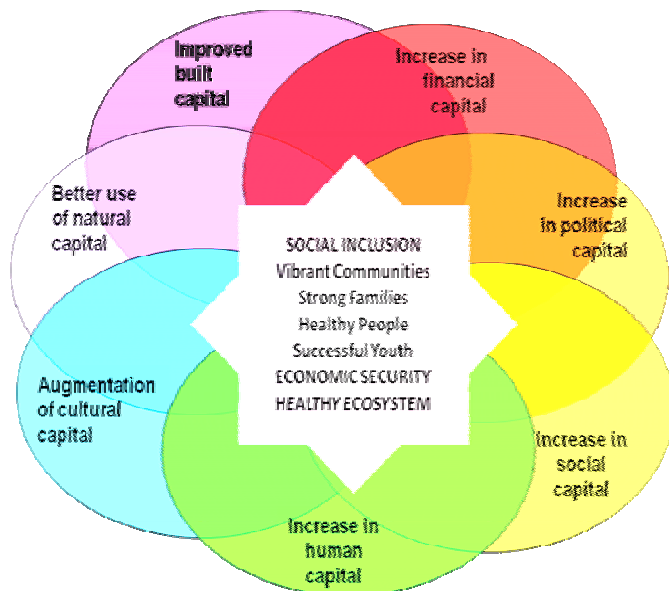


Figure 11. Community Capitals (Source: Butler Flora, 2010)

Capital can be defined as “resources invested to create new resources over a long time horizon”. The concept of community capital goes beyond conventional economists’ narrow view of capital as monetary investment to create monetary wealth. The latter tends to lead to unsustainable exploitation of resources, the degradation of the basic resource, natural capital, and increased inequality.

Briefly, the different community capitals are (Butler Flora, 2010):

Natural capital: Air, Water, Soil, Biodiversity, Landscape; providing resources, cultural identity and wellbeing, but ultimately defining the limits to human action

Cultural capital: Ways of knowing and seeing the world, Food and language, Ways of being, Framing of change, Defining value.

Human capital: Education, Skills, Health, Self-esteem, Self-worth, individual resources that can benefit the whole community.

Social capital: Mutual trust, Reciprocity, Community groups, Collective identity, Sense of shared future, Working together.

Political capital: Organisation, Connections, Voice, Power, Civic engagement; the ability of a

group to influence the distribution and use of resources

Financial capital: Savings, Debt capital, Investment capital, Tax revenue, Tax credits, Grants. Usually the most prized capital because it is easy to measure, and in today’s economic system, the easiest means of buying or creating other community capitals. There is a tendency to put other capitals into financial capital terms.

Built capital: Homes, Leisure centres, Roads, Schools, Playgrounds, etc: constructed infrastructure that contributes to or detracts from other community capitals.

Different community capitals can often be converted into each other. For example, social capital can be used to enhance political capital through community organisations influencing the distribution of financial capital, which could then be used to build human capital, directly through educational funding, or through built capital for school construction. Similarly social and human capital, in the form of voluntary work, could be employed in improving built capital (e.g. a community building), or natural capital (e.g. managing a woodland).

This means that even where financial resources are shrinking, as in the current economic situation, mobilising other kinds of capital can achieve results that contribute to the transition.

Health and other public services

With the economy of Wales set to take a dive because of the imminent 25% cuts in public spending (consider what will that mean in terms of the amount of money spent locally, with the public sector the main local employer), it is clear that we need radical transformation.

This could be the crisis that brings ideas that hitherto have been seen as whacky become mainstream – it is the time for sustainable development. The new opportunity is for collaboration in finding solutions and building localities – communities – that are resilient and sustainable.

The launch of the Wales Alliance for Citizen Directed Support (WACD) may herald a new approach to health and social care. It is about

building or re-building sustainable, resilient communities from the bottom up, whole-community wellbeing, and the holistic delivery of a bespoke range of services directed by the individuals in need.

The Welsh Alliance of Citizen Directed Support is working to develop and promote a model of citizen directed support for Wales.

It is made up of organisations are working to create a model of citizen directed social care services for people in Wales.

We are made up of:

- *Local Authorities that commission services*
- *Organisations that deliver services*
- *Organisations that represent the people who use services.*

The Alliance has 2 components

- *A Steering Group which works to promote policy and practice change in this area.*
- *A Provider Network which supports provider organisations to learn and develop competence in this area of work.*

<http://wacds.org.uk/about/>

Locally, Ceredigion's draft Health, Social Care and Wellbeing Strategy seems to be a step in the direction of a holistic approach to community wellbeing. The strategy's vision is:

- *To tackle the underlying factors that influences our health in order to reduce inequities in health outcomes.*
- *To make better connections as organisations, partnerships, communities and individuals to ensure effective and meaningful participation, consultation and feedback on health, social care and well being in Ceredigion.*
- *To ensure the maximisation of opportunities and support for people to improve their health and wellbeing.*
- *To improve the quality and integration of services so as to ensure that the services that we deliver are commissioned and delivered effectively and efficiently according to local need, within our local communities where practicable.*

(CCC, 2010, p 15)

Health, Social Care and Wellbeing (by Rachel Auckland)

The local health and social care sector can be seen as a cross-cutting theme, illustrating how new models of economics, industry, energy saving/energy production and food/agriculture could be applied.

Cradle-to-cradle health care products

- *Opticians send used glasses to developing countries*
- *Local social enterprise recycles rags from charity shops into reusable bandages, hankies, felt nappies and towels*

Renewable Energy in healthcare

- *Taliesin Medical Centre becomes self-sufficient in electricity from solar panels (made in Wales from recycled materials).*
- *Volunteers in Longwood Community Woodland keep fit coppicing firewood for a district heating system in the secondary school/leisure centre and /or for people vulnerable to fuel poverty.*
- *Where the rickshaw ambulance service cannot provide transport to hospitals/clinics, biodiesel from recycled cooking oil is used in classic vehicles, supplemented by a modern fleet of ambulances run on electricity generated from hospitals' own wind turbines.*

Reduced energy needs

- *NHS Estates managers are responsible for securing energy savings in all health service buildings throughout Wales, through energy efficiency measures and staff training.*
- *Telemedicine and renal self-care reduce the need for travel to healthcare centres.*
- *A revival in traditional herbal remedies reduces the need for industrially-produced medicines.*
- *Money is invested in research into the effectiveness of a range of personal healthcare approaches (e.g. yoga, tai chi) and complementary therapies to increase wellbeing and reduce the need for energy-intensive medicine.*

Food and Health/Social Care

- *All primary school children grow and cook healthy, sustainable food for themselves and for a 'meals on wheels' service to elderly people living in their own homes throughout the area.*
- *Secondary school children spend PE lessons generating bicycle-powered energy to produce healthy food, using local produce from the market, for elderly people's luncheon clubs and care homes.*

Time Banking

What does all this mean in practice for the Lampeter transition area?

Voluntary work is all very well, but people still need some form remuneration in the end. Bartering is a form of remuneration that is used in the absence of monetary payment, but runs the danger of increasing inequity by excluding those unable, for whatever reason, to compete in the informal economy.

Time Banking can be seen as a means equitably formalising barter, and of converting social and human capital in to other community capitals.

Time Banking is a form of reciprocal exchange based on the use of units of time as currency. A person is able to earn a time credit by providing a service to another individual or to an organisation. Credits can be exchanged for services or to buy participation in events and activities. Time Banking operates on a strict one-to-one basis: one hour of time buys one hour of another's services, or one hour of participation. This is where it differs from Local Exchange Trading Schemes (LETS), where participants are able to set their own rates.⁵

The ex-mining community of Blaengarw is a pioneer of time banking. Since 2004, the time bank has grown to over 700 individual members and 34 groups, 'co-producing' 24,000 hours per year in a wide range of activities that benefit the community⁶.

The organisation Spice⁷ is now developing a means of a national agency-to-agency time bank which will enable organisations to exchange services, knowledge and skills.

In times of high unemployment when money is less available (ie financial capital is low), time banking becomes a powerful way of re-building a local economy.

Making the most of financial capital - while it lasts

It will take time for time banking to grow in the Lampeter area, and it is not clear whether it could be used for exchanging goods: the calculations required to convert time into things equitably would be problematic and complicated. So transition will require the investment of money as well. This is where making use of current opportunities for finance (grants and loans) become important: these must be used to invest in the local economy in order to get money circulating in the area for re-investment, and importantly to keep it in the area.

Investing in renewable energy and local food seem key areas to concentrate on. Not only do these have great potential for generating income, but they can directly address the need for reducing fossil fuel dependency and greenhouse gas emissions.

Here the local multiplier effect is vitally important. As money circulates it can be spent locally (e.g. in a local food shop) or allowed to leak away (e.g. by spending it in a supermarket, where much of it leaves the area). With each turn of the earn-spend cycle, it follows that there begins to be an exponential effect – the multiplier effect. If only 20% remains in the local economy, this multiplier is insignificant. If 80% is spent and stays locally, the multiplier becomes large and creates potential for regeneration (Ward et al, 2002)

⁵ <http://www.timebankingwales.org.uk/links.php>

⁶ <http://www.creation.me.uk/>

⁷ <http://www.justaddspice.org/>



Photo: Transition Llambod

Reducing our energy needs

It is doubtful that our current wasteful use of energy could be supported by renewables without unacceptable costs to our environment and landscape. So it is essential to reduce our energy consumption dramatically.

It is possible to reduce energy needs by over 50% in Britain (MacKay, 2009; CAT, 2010). This may be less for the Lampeter area due to our remoteness and old, energy-inefficient housing stock. But by planned adaptation and targeted campaigns to enable change, we should be able to achieve significant reductions in energy consumption.

Buildings

In the UK, housing gives rise to 28% of energy demand and 30% of greenhouse gas emissions. So achieving reductions in energy consumption domestically is essential.

Space heating and cooling

This refers to heating and cooling homes and workplaces, hot water, cooking, refrigeration. MacKay (p 53) estimates energy used for these purposes as 37 kWh/d per person (hot water: 12, space heating: 24, cooling: 1).

The four key ways to decrease space heating demand are to:

- 1) *Improve the insulation or “fabric” of buildings;*
- 2) *Decrease draughts;*
- 3) *Decrease the heat demand through:*
 - a. *Good “passive” design to increase natural heat gains;*
 - b. *Decrease area requiring heat;*
 - c. *Decrease the thermostat/air temperature.**Thermal comfort can be maintained through good design resulting in warmer surfaces and less draughts;*
- 4) *Improve the efficiency of heating technology.*

The target for domestic houses should be 70% reduction in space heating energy demand as a whole with variation depending on building type. (CAT, 2010, p84)



Figure 12. Current energy consumption per person per day (kWh) (Source: MacKay)

Relatively simple interventions such as draught exclusion, loft insulation, cavity wall insulation and double glazing can reduce energy demand for space heating by around 50%.

MacKay (p 296 and pp 142-144) has demonstrated a 67% saving on his own home without any internal or external cladding. His main physical modifications were to install a new condensing boiler and a thermostat that allows different target temperatures to be set for different times of the day. He also installed cavity wall insulation, improved his loft insulation and added more double glazing. MacKay maintains that the two most effective

changes were not physical but behavioural: the frequency at which he read his energy meters, and the temperature at which he set his thermostat. He recommends reading the meters once a week, and setting the thermostat low (at 13C or 15C) and turning up the heat whenever the occupants feel cold. In these ways, MacKay reduced his gas consumption from 40 to 13kWh/d.

Of course much of the housing stock in the Lampeter area is significantly leakier than MacKay's home in Cambridge. The energy-related characteristics of housing in Ceredigion are summarised as follows:

1954 dwellings (5.3%) lack any form of appropriate loft insulation, an additional 2,574 dwellings (7.1%) contain loft insulation levels below 100mm. Evidence of enhanced insulation is however apparent. 7,136 dwellings (19.5%) offer loft insulation to 100mm, 12,192 dwellings (33.3%) to 150mm and 12717 dwellings (34.8%) to 200mm or above.

Excluding dwellings of solid wall construction, 9,037 dwellings exhibit evidence of additional external wall insulation since built. Although this represents only 43% of dwellings with cavity walls, the need for additional insulation will decrease in modern properties against increasing building regulation requirements, at the time of construction, i.e. 6,107 cavity-wall dwellings (29.0%) were constructed post-1981.

26,273 dwellings (71.8%) are double glazed, the remaining 10,300 dwellings (28.2%) have single glazing. 24060 dwellings (65.8%) have effective draught proofing to windows/doors.

29,499 dwellings (80.7%) offer full central heating with an additional 1963 dwellings (5.4%) offering partial heating systems. Central heating is not available in 5,111 dwellings (14.0%). (Adamson, p 67).

AREA	SAP RATING ⁸	CO ₂ EMISSIONS (tonnes p.a.)		ANNUAL RUNNING COST (£'s p.a.)	
	average	average	total	average	Total
Lampeter	63	6.01	7,235	696.13	838,142
Rural Ceredigion	50	8.13	182,637	788.18	17,713,664

Table 3 ENERGY EFFICIENCY RATINGS BY AREA AND HOUSING SECTOR (Source: Adamson et al, 2007, p 23)

The main areas that will need significant investment are improving insulation and installing more efficient heating systems, such as heat pumps.

Refurbishment of much of the local housing stock is difficult because of the prevalence of old solid-walled buildings, but possible.

⁸ Standard Assessment Procedure (SAP) is the UK Government's recommended system for measuring the energy rating of domestic dwellings. It calculates the typical annual CO₂ emissions and energy costs for space and water heating, and from 2005, lighting. SAP is expressed on a scale of 1 (highly energy inefficient) to 120 (highly energy efficient). At the time of the Ceredigion House Condition Survey a target of SAP 65 was aimed for under the Welsh Housing Quality Scheme (WHQS).

Clearly a massive programme of refurbishment, retrofitting properties with energy-saving measures, will be required in order to improve energy efficiency by 50%, let alone by 70%.

Refurbishment is to be preferred to demolition and rebuild for a number of reasons:

- Less disruption to occupants
- Lower embodied energy (ie the amount of fossil fuel energy per unit of material due to its manufacture and transport)
- Demolition and rebuild often results in the demolition of perfectly viable homes
- Difficulty of demolition and rebuild on a house-by-house basis
- Demolition and rebuild tends to have higher costs and longer time scales, due for example to need to renew infrastructure and services.

On solid-wall buildings, wall insulation can only be improved significantly by cladding, either internally or preferably externally. This increases costs dramatically, especially in the latter case where re-roofing will often be required.

Whether refurbishment or demolition and rebuild is carried out, it is important to minimise the embodied energy of materials by sourcing locally-available natural grown or recycled materials. Using natural materials (grown or recycled) will lock up (sequester) carbon in buildings, thereby reducing greenhouse gas emissions. It will also contribute to the local sustainable, cradle-to-cradle economy.

New buildings should be built to good “passive” designs to increase natural heat gains, using materials made from renewable resources, and incorporate appropriate renewable energy technologies.

The enormous cost of refurbishing all energy-inefficient housing in the Lampeter area would at first sight seem prohibitive. However, costs can be reduced in a number of ways:

- Large-scale refurbishment, in one location, or street-by-street, - all the skills and materials can be in one place.

- Engaging the support and enthusiasm of residents
- Adopting a “whole house approach”: designing a strategy for the house – the sequence of priority of different measures - instead of incremental improvement of individual aspects to pre-conceived plans.
- Using models such as “Pay As You Save” (PAYS) and Energy Service Companies (ESCOs) where energy savings accrue to service providers or installers, potentially making energy efficiency measures free to the occupier. (CAT, p 90-97)
- Making use of the financing schemes run by energy suppliers and government⁹, all though it may be difficult to apply the whole-house strategy and achieve large scale refurbishments through such schemes.

PAYS enables residents to upgrade their home’s energy performance without upfront financing. A refurbishment provider uses third party finance to cover upfront costs. Repayment is made through a tariff linked to the building’s meter. The repayment tariff is set up to cost less than the amount of energy saved. The obligation to repay is linked to the property, not the current owner or occupant. (ibid, p 90)

ESCOs provide an energy service to the customer, rather than simply energy by the unit. Under one model, the customer pays the ESCO to keep their home at a certain temperature, rather than paying per unit of energy. The ESCO therefore has the incentive to improve the energy efficiency of the homes they serve. (ibid, p 97)

⁹ See <http://www.energysavingtrust.org.uk>

Improved heating systems

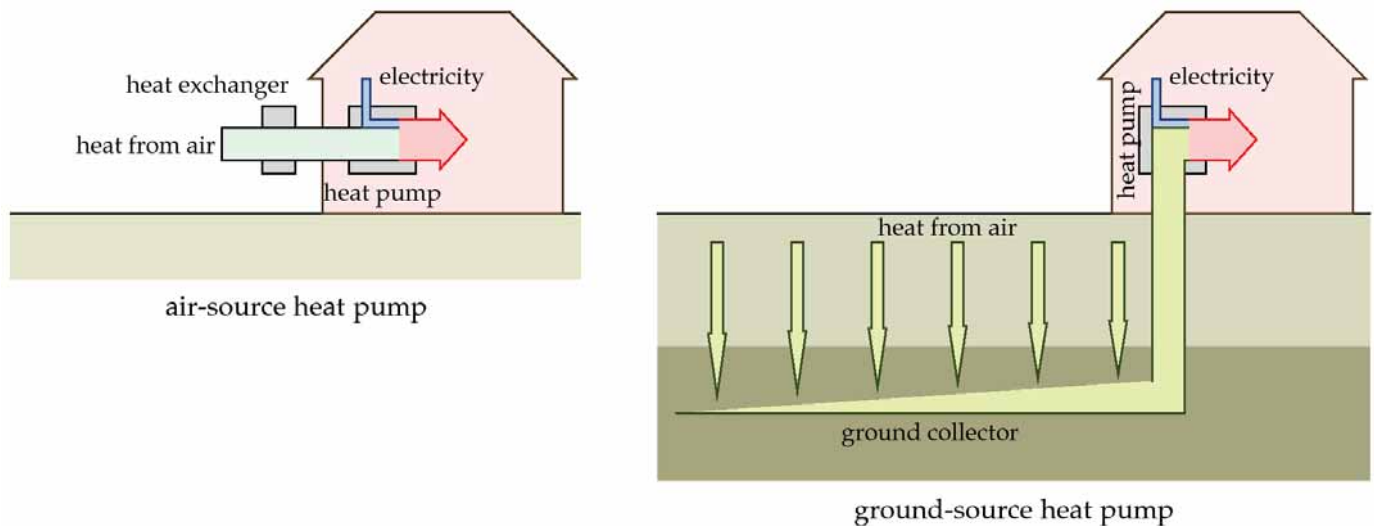


Figure 13. Heat pumps (Source: MacKay, p 146)

Natural gas condensing boilers have efficiencies¹⁰ in the range of 78%-90% (MacKay, p 144). However, it can be shown that heat pumps can be more than 140% efficient (ibid, p 151). Essentially, this is because heat pumps take heat from the ground or air and pump it into buildings, using less than one unit of electricity for every unit of heat delivered. Heat pumps can be a more efficient means of heat than Combined Heat and Power (CHP), as distributing the heat from a power station reduces its efficiency at producing electricity. The heat pump approach would fit well with a renewable energy infrastructure aimed at producing as much electricity as possible.

Heat pumps have coefficients of performance ranging between 2 and nearly 5¹¹. Ground source heat pumps are usually considered to be the more efficient. However air source heat pumps with coefficients of performance of 4.9 are now available (ibid, p 153). Hence it will often be preferable to install air source, rather than ground source: there is less disruption

¹⁰ i.e. the proportion of the energy delivered that is actually used to heat the building: the rest escapes through the flue.

¹¹ A coefficient of performance of 4 means that for every unit of electricity used, 4 units of heat are delivered to the building.

involved (no digging trenches or boreholes to lay pipes). Moreover, too many ground source heat pumps concentrated in a small area could potentially significantly lower the ground temperature, reducing the efficiency of the pumps.

Transport

Transport contributes to 29% of greenhouse gas emissions in the UK, 40% of which is from private vehicles.

Switch fuel

Electric vehicles already produce approximately 50% less emissions than conventional. This will reduce further as the electricity generation system changes from fossil fuels to renewables.

The extra need for electricity generation could be largely offset by overnight charging, when demand is low (this would also reduce the need for pumped systems for storing electricity generated in excess of demand).

Hydrogen produced by electrolysis using renewable electricity may have a small role, though at present the process uses twice the energy required than if using batteries.

Biofuels are currently often produced from unsustainable sources, or take land out of food production. However biofuels produced from

sustainable feedstock (e.g. wood or certain grasses) would play a role in areas where electrification is impractical, such as some farm machinery, heavy goods vehicles and aviation.

Changes to vehicles

Making vehicles lighter would increase efficiency by up to 10%; improved aerodynamics and tyre design could give another 2%-4% saving.

Emissions due to manufacturing replacement vehicles would be approximately equivalent to annual emissions from all UK's transport.

Reduce the need for (private) transport:

- Average reduction of 20% in domestic transport distances.
- Increasing average occupancy rates of private vehicles from 1.6 to 2. Promotion and use of car clubs, lift share schemes, etc.
- Planning public, health, retail and other services so that these are provided in locations that require the least private transport at the same time as improving public and community transport links.
- Increasing home-working, local workplaces and other solutions will help to reduce commuting needs.

Renewable Energy

If the Lampeter area is to embrace the cradle-to-cradle economy, and be resilient to the challenges we have outlined, it must be able to generate much of its own energy in a sustainable, non-polluting way.

Here we look briefly at CAT's Zero Carbon Britain scenario, which would fit largely with the Green Compact future scenario, as it requires a massive scaling up of renewables, particularly offshore wind, throughout the UK. We then outline what might be required in order to achieve self-sufficiency in energy for the Lampeter transition area in the context of the Local Stewardship scenario. To our knowledge, this has never been done before, so the scenario should be regarded as a first sketch, and certainly not a recommended option, but a basis for further investigation. We also look in general terms at biogas production, particularly from anaerobic digestion, as this has been suggested as an alternative to fossil fuel natural gas for the Lampeter ward. Finally we include initial assessments of the wind and hydro options that we recommend be considered for development in the very near future, in order to start the development of renewables in the area, take advantage of the Feed in Tariffs and currently available grants for the installation of community renewables.

The Lampeter area is relatively geographically large with a small population, which is an advantage where small-scale renewable energy is concerned. We have huge potential for developing electricity generation from solar, wind and water.

We also have land available for the production of wood and other biofuels, but it must be stressed that the use of these should be carefully managed and limited in order to conserve wildlife habitats and produce food and building materials. Hence the energy needs of heating and transport will need to be provided substantially by renewable electricity. This will be in the form of heat pumps for heating and electric vehicles, both of which are more

efficient in their use of energy than their fossil-fuel- or biofuels-based counterparts (MacKay).

Renewable energy generation has never been more financially viable than now. This is because of the introduction of the increased Feed-In Tariffs (FITs) for renewable energy generation in April 2010, together with the existing Renewable Obligation Certificates (ROCs) and the expected Renewable Heat Incentives¹².

The improved financial viability of renewables means that we have the opportunity to begin building a local generation system which could become the basis for a sustainable, cradle-to-cradle economy for the Lampeter area.

Microgrids and electrification

Fundamental to producing enough energy locally will be the development of a distributed system of electricity supply through microgrids.

Microgrids are capable of coping with very local, small-scale generation and transmission of electricity. They reduce transmission losses seen in the current national grid system with power generation at great distances from consumption. Microgrids are, however, relatively expensive to install.

In the absence of oil, gas and coal to provide for our heating and transport needs, electrification will be crucial to transition, together with limited use of wood and other biomass.

¹²

http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/policy/incentive/incentive.aspx

Current electricity supply

The electricity supply for the UK is shown in the table below:

Electricity supply source	supplied TWh	supplied %
natural gas	377.2	39.09%
coal	347.7	36.03%
nuclear	138.5	14.35%
thermal renewables	41.1	4.26%
petroleum	20.5	2.12%
imports	12.3	1.27%
manufactured fuels	11.3	1.17%
hydro	9.3	0.96%
wind and wave	7.1	0.74%
Total	965	100.00%

Table 4 Electricity supply in the UK, 2008
(Source: Dept of Energy and Climate Change, CAT, 2010 p 237)

Electricity use is as follows:

Electricity use	used TWh	used %
conversion, transmission and distribution losses	591.6	61.31%
domestic	117.8	12.21%
other industry	108.7	11.26%
other consumers	101.7	10.54%
energy industry use	30.6	3.17%
transport	8.4	0.87%
iron and steel	4.9	0.51%
exports	1.3	0.13%
Total	965	100.00%

Table 5: Electricity use in the UK, 2008 (Source: ibid)

These figures highlight the enormous inefficiencies in the current generation and distribution system based on fossil fuels: over 60% of the potential is lost in conversion of chemical energy in to electrical energy in conventional power stations, and the transmission and distribution of electricity in the national grid. It is important to realise that, although the efficiencies of many renewables

may seem low (for example approximately 29% in the case of wind), the losses associated with an electricity generation system based on renewables with more localised distribution would be considerably less.

Units of power and energy: Watt hours (and kWh, MWh, GWh, and TWh) are measures of *energy* (ie the ability to do work). Watts (W), kW, MW, GW, and TW are measures of *power* (ie the rate at which work is performed or energy is converted). Using 40W of power (like an incandescent light bulb) for one hour uses 40Wh of energy. Using 40W for a day uses 24x40Wh = 960Wh, or 0.96kWh, or roughly 1kWh or one unit of energy. So a 40W light bulb left on for one day would use about one unit of electricity. TWh stands for "Terawatt hour", 1TWh = 1,000GWh (Gigawatt hour), 1GWh = 1,000 MWh (Megawatt hour), 1MWh = 1,000 kWh (kilowatt hour, or one "unit" of energy), 1kWh = 1,000 Wh (Watt hours). The unit often used here of kWh/d is the number of kWh or units of *energy* used or supplied per day, or in other words the average *power* consumption.

The local electricity grid

The primary distribution points around the Lampeter area are:

- Saron (A484 near Llandysul) - fed by a 132kVA line from Carmarthen.
- Lampeter - Cwm Ann side
- Llanarth - just south of village

Other grid connection points (33kVA lines) include are at:

- Felinfach
- Tregaron
- Llanfihangel-ar-Arth (just east of Llandydul): the New Allt Walis wind turbines (possibly 12 turbines of 3.7MW each) may feed into the grid here.
- Newcastle Emlyn

Subject to negotiations with the power company, wind turbines of 50-100 kW capacity may be able to feed in to 11kVA lines as long as they are not too far (perhaps up to 3-4 miles) from primary or grid connection points (lines of

a minimum of 33kVA),. (Charles Holford, personal communication, 2011)

The high-voltage, direct current (HVDC) lines shown in table 8 may not be exactly what is required for the Lampeter area, and do not take in to account the proposed distributed generation and microgrid technology, but have been included in recognition of the need to upgrade the aging grid that is not currently well suited to small scale electricity generation

Future electricity generation

Electricity generation under CAT's Zero Carbon Britain 2030 (ZCB2030) scenario relies heavily on Britain's considerable offshore wind resource, requiring 19,500 10MW turbines (predicted to be available in the near future, replacing the current maximum turbine capacity of 5MW). This would represent a cumulative investment of over £315 billion between 2009 and 2030 (ibid p 267-269).

Under ZCB2030, electricity generation is as follows:

electricity generation	TWh	%
offshore wind	615	73.01%
onshore wind	75	8.90%
fixed tidal	36	4.27%
wave & tidal stream	39.5	4.69%
hydro	7.23	0.86%
solar PV	4.4	0.52%
biogas	24.14	2.87%
biochar	2.19	0.26%
biomass	31.4	3.73%
nuclear	7.5	0.89%
Total	842.36	100.00%

Table 6 Electricity generation in the UK under ZCB2030

For completeness, the production of heat is also shown:

heat generation	TWh	%
biomass	53	15.23%
biomass chp ¹³	19	5.46%
heat pumps	148	42.53%
biogas	4	1.15%
solar hot water	24	6.90%
electric heat	100	28.74%
Total	348	100.00%

Table 7 Heat generation in the UK under ZCB2030 (Source: ibid pp 261-264).

¹³ chp: combined heat and power

MacKay's "cartoon Britain"

MacKay (p 115) uses a much simplified model for energy consumption and production, he calls this "cartoon-Britain". The model boils energy consumption to three forms: heating (40 kWh/d/p, currently all supplied by fossil fuels), transport (40 kWh/d/p, currently supplied by fossil fuels), and electricity (18 kWh/d/p). Currently almost these are supplied from fossil fuels. Converting fossil-fuel energy to electricity is 40% efficient, so supplying 18 kWh of electricity in this model requires a fossil-fuel input of 45 kWh/d/p.

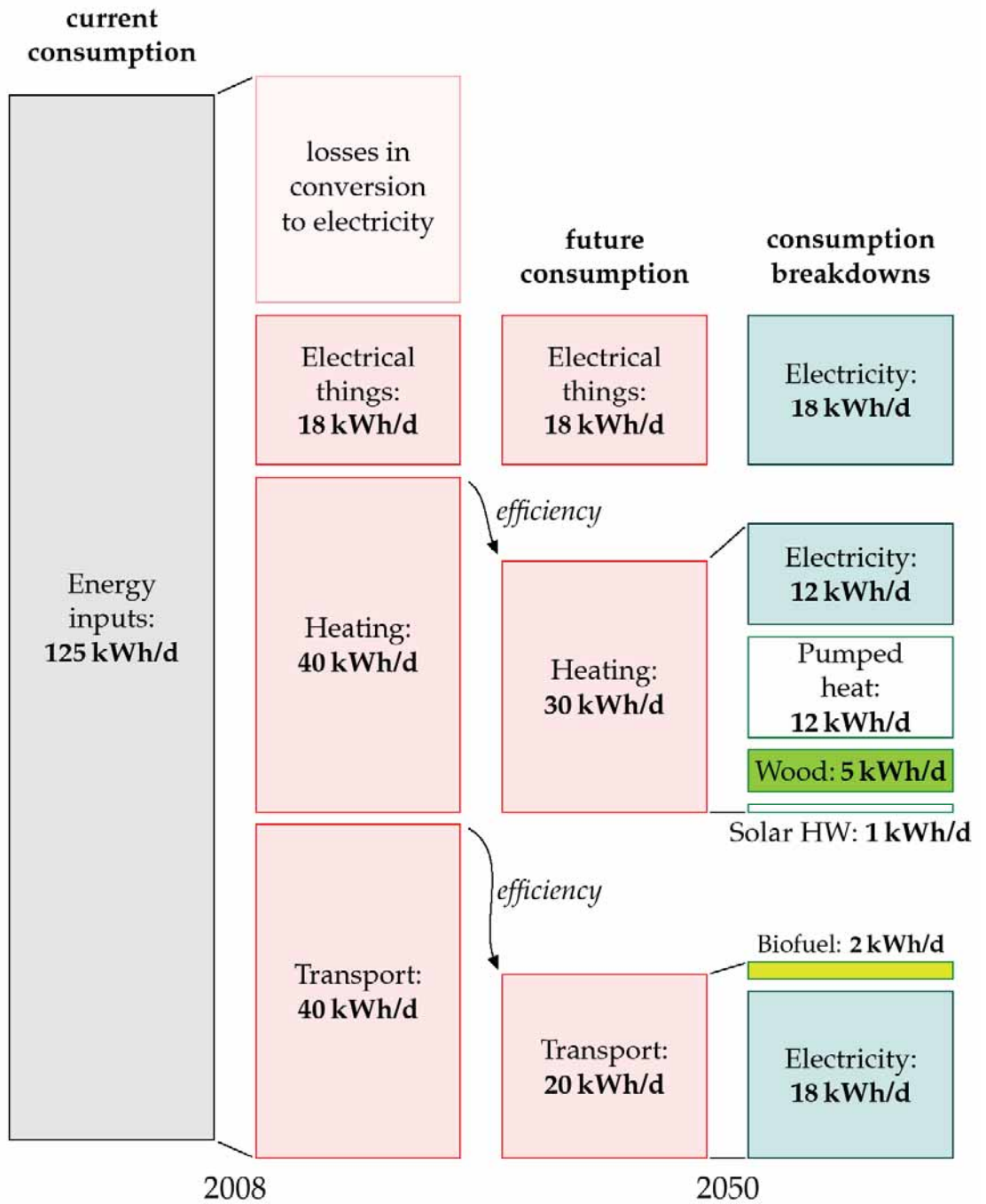


Figure 14. Future consumption in "cartoon-Britain" (Source MacKay, p 204)

MacKay's model ignores important details, such as agriculture and industry, and the embodied energy of imported goods. However, heating, transport, and electricity account for more than half of our energy consumption, so the model allows simple calculations to come up with a rough sketch of the scale of the options for ending dependency on fossil fuels.

Note that the basis for both Zero Carbon Britain 2030 and MacKay's analysis is the production of electricity from non-fossil-fuel sources. Hence, in spite of reductions of total energy requirements in the order of 50%, the capacity to generate electricity needs to increase dramatically.

Some of the options described by MacKay are illustrated below:

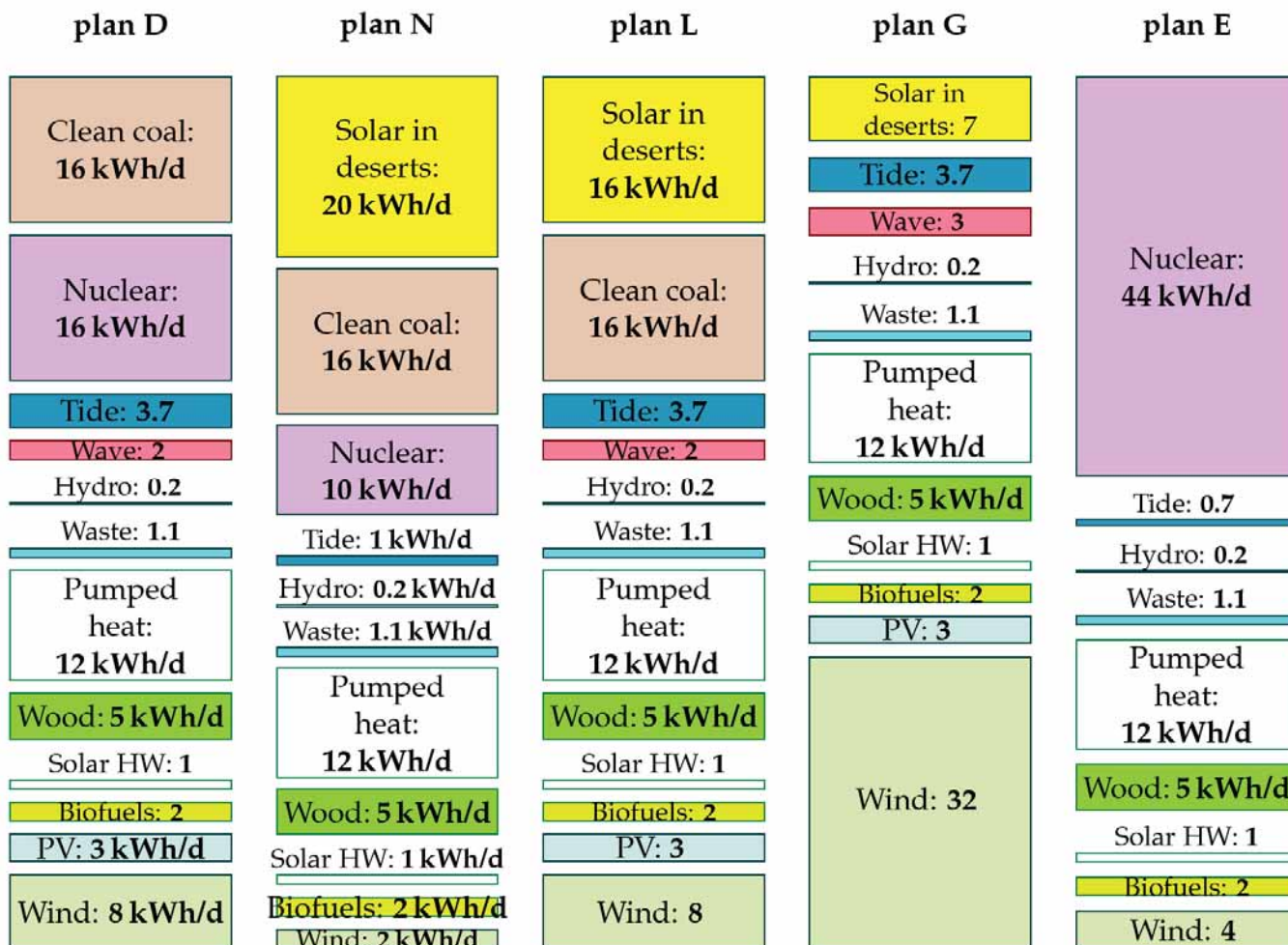


Figure 15. MacKay's plans D, N, L, G, and E (Source *ibid*, p 212)

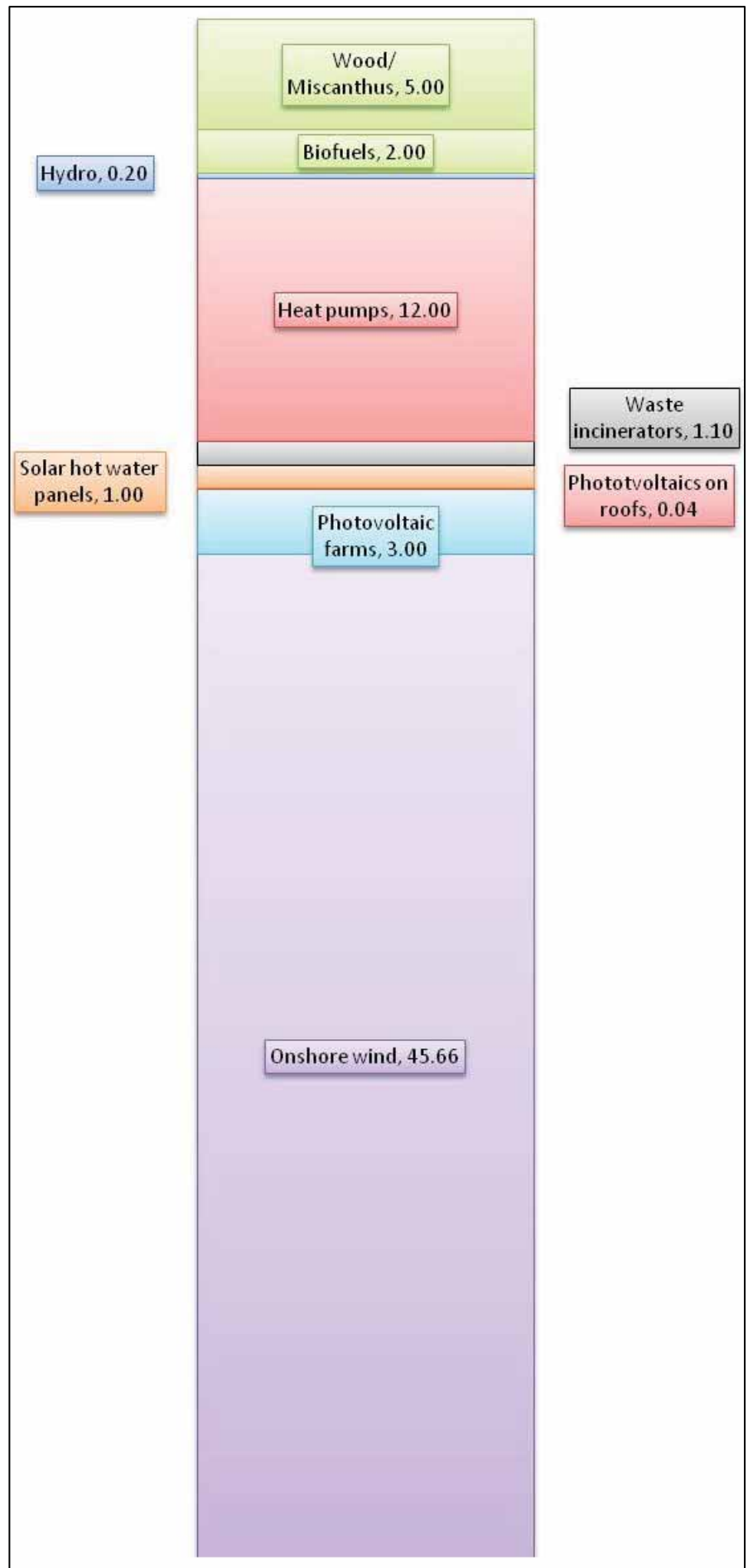
“Plan TLI”

The sketch scenario that follows (“Plan TLI”, Figure 16, Table 8) is based mostly on MacKay’s plans G and M, with proportionate reduction to the scale of the Lampeter area. In addition technologies such as nuclear and clean coal, generally regarded as “unsustainable” by the transition movement, have been removed entirely. Also removed are resources unavailable in the area, such as solar in deserts, tide and wave, in order to show the options available for energy self-sufficiency, as might be required under the Local Stewards scenario.

Pumped storage

Table 8 also shows the additional infrastructure requirements that do not produce energy in themselves, but are required for storage, transmission and distribution. These requirements have simply been scaled down to the level of the Lampeter area, so economies of scale have not been taken in to account. Electricity “storage” is required because renewables are not generating continually, unlike fossil-fuel power stations; “the wind doesn’t always blow”. Storage is achieved by using surplus renewable electricity to pump water uphill to a reservoir. When extra electricity is required, appropriate amounts of water are released and drive water turbines to generate electricity (an existing example in Wales is “Electric Mountain” at Llanberis¹⁴).

Figure 16. Plan TLI”



¹⁴ http://www.fhc.co.uk/pumped_storage.htm

Renewable technology ¹⁵	Area covered (ha)	Proportion of Lampeter Area covered	Capacity (kW)	Total cost (£M)	Cost per person (£)	Efficiency or load factor	Average power delivered (kWh/d/p) ¹⁶
Onshore wind	84.8	0.37%	57,080	44.0	4,893	29%	45.66
Pumped storage ¹⁷	-- ¹⁸	--	4,500	2.3	250	--	--
Photovoltaic farms	22.5	0.10%	10,800	42.8	4,750	10%	3.00
Photovoltaics on roofs ¹⁹	0.9	0.01%	99	0.4	44	14%	0.04
Solar hot water panels ²⁰	0.9	0.01%	375	10.8	1,200	96%	1.00
Waste incinerators	--	--	450	1.3	142	88%	1.10
Heat pumps	--	--	31,500	9.0	1,000	14%	12.00
Hydro	--	--	--	--	--	--	0.20
HVDC power lines ²¹	--	--	15,000	0.3	33	--	--
Biofuels	450.0	1.97%	--	--	--	--	2.00
Wood/ Miscanthus	465.0	2.04%	--	--	--	--	5.00
Totals	1072.1	4.50%	119,804	110.8	12,311	--	70.00

Table 8: “Plan TLJ”: tentative, approximate areas of land, rough costs and average power delivered from a range of renewable technology options in order for the Lampeter Transition Area to be self-sufficient in energy.

¹⁵ Unless otherwise indicated, the data for these calculations are derived from those cited in MacKay (p 216), who bases them on existing installations. The area of the four wards is approximated to 22,800 ha, the estimated population of the Lampeter area is approximated to 9,000 in 2006 (<http://www.statistics.gov.uk/statbase/Product.asp?vlnk=13893>).

¹⁶ kWh/d/p: kWh per day per person.

¹⁷ Based on MacKay’s (op cit) figures for the Dinorwig (30GW) facility, with proportionate reduction in requirement commensurate with the population of the Lampeter Area.

¹⁸ -- not estimated/not applicable

¹⁹ PV of roofs does not feature MacKay (ibid) the calculations here are based on those of Charles Holford (op cit) and assumes 1m² per person of 14% efficient panels.

²⁰ Assumes 1m² of roof-mounted panel per person.

²¹ Assumes land costs £7,500 per ha

Plan TLI is not a solution; it is intended to inform discussion, consideration of the desirability or feasibility of self-sufficiency in energy, and the basis for further detailed assessment of local renewable resources and more carefully costed options.

The data given here could be used for initial tests of different options or mixes of renewables. For example, it may be thought to be unacceptable, given vocal opposition to wind, or not feasible given the wind resource, to install 57,080 kW of wind capacity (equivalent to over 67 of the turbines suggested in the wind assessment below). In which case, the model could be adapted with reduced wind, and increased biomass or PV on roofs.

Assessments of hydro and wind potential

Hydropower Resource Assessment

Introduction

Following instruction and discussion with Bob Jacques of Ymlaen Ceredigion, an initial resource assessment of the water power resource of the RDP study area has been completed by Andy Rowland.

Technology and methodology

Hydropower schemes can be classified according to the head of water available at the site, with the normally accepted classifications being:

- High head > 50m
- Medium head 10-50m
- Low head <10m

A good quality hydro installation will generate electricity for at least 40 years. Assuming an annual saving of 1.6 tonnes per year of CO₂ for a 10 kW scheme (compared with fossil fuel generation), then over the lifetime of the scheme this would amount to a saving of 24 tonnes of CO₂.

The energy in water is a function of the weight of water and the vertical height through which it falls, usually expressed by the rate of flow, Q, and the head, H.

The rate of flow (Q) is the volume of water passing per second and is usually expressed in cubic metres per second, m³/sec (often called 'cumecs'). The head (H), expressed in metres, m, is the net head applied across the hydro installation and, due to efficiency losses incurred, will be less than the gross head, which is the maximum available vertical fall across the site.

An initial estimate of the **gross head** for potential sites in the area has been made from Streetmap.co.uk by simply counting the contours between the possible inlet and discharge points, to give the height difference.

The gross annual flow in a river or stream is the product of the size of the catchment multiplied by the annual rainfall, less any water that is removed from the catchment by way of evaporation, transpiration or by abstraction for agricultural or industrial use or public water supply. A certain minimum volume of water, termed the 'residual' or 'compensation' flow, must be left in the section of river or stream which bypasses the hydro site, both to protect the ecology of the river in the depleted stretch and for environmental and aesthetic reasons.

Flow can be estimated by a computer program, which will calculate a range of flow values and produce a Flow Duration Curve for a given site.

Literature review

Some of the technology text above is taken from the excellent report *Peak Power: Developing micro hydro power in the Lake District* (Friends of the Peak District 2010), available from www.friendsofthepeak.org.uk/Campaigns/Climate_change/Small_scale_hydro_power/

Another good guide is the British Hydropower Association (BHA)'s *Guide to mini hydro*, available from www.british-hydro.org/mini-hydro/index.html

Other references can be found at www.powerfromthelandscape.co.uk/links/micro-hydro-resourcesguides

DECC and WAG commissioned the *England and Wales Hydropower Resource Assessment* from the BHA and IT Power in 2010. It referred to sites identified by (amongst others) the Salford University report *Small Scale Hydroelectric Generation Potential in the UK, Volume 1-3*. (University of Salford for the Energy Technology Support Unit (ETSU), Department of Energy, 1989). None of the four sites in Ceredigion listed in the Assessment as being likely to be viable are in the study area. These reports are available from

www.decc.gov.uk/en/content/cms/what_we_d_o/uk_supply/energy_mix/renewable/explained/microgen/micro_hydro/micro_hydro.aspx

Constraints

As well as sufficient head and flow, a viable scheme needs to satisfy the following factors:

Protection of the watercourse, as regulated by Environment Agency Wales and embodied in appropriate Licences.

Planning permission, considering noise, visual and other possible impacts.

Access for plant and materials to the intake and powerhouse (turbine) sites.

Proximity to three-phase "Grid" i.e. the electricity distribution system, so that costs for exporting electricity are minimised. The capacity of the distribution system also needs exploring, though is usually adequate for micro hydro.

Land ownership issues - riparian (bankside) rights as well as land ownership.

Factors 3 and 4 have been considered in this study, but only from maps.

Findings

A long stretch of the upper Teifi flows through the southern perimeter of the study area around Lampeter and Llanybydder. The Teifi is quite mature by this stage in its course, with a good flow but a very gradual drop in height. While site visits might reveal a few sites suitable for low-head hydro schemes (requiring a drop of a few metres over a short enough horizontal distance to be economic), no big sites stand out.

There is typically a 30-40m drop to the Teifi from the watershed that lies to the south east,

with the short tributaries collecting from relatively small watersheds, so hydropower potential probably is limited to small schemes that could supply one property only.

The Teifi tributaries flowing to the SE tend to be longer, and so have larger watersheds and more potential. While there may be options for several farm-based schemes, three sites appear to have more significant potential:

Betws Bledrws on the Afon Dulas, with a head of around 25m;

South of Castell Olwen below the confluence of the Dulas and Denys, with a head of around 10m but a large catchment area;

Cwrtnewydd, where there may be more than one option with 20 - 30 m heads on Nant Cledlyn and its tributaries.

The Aeron runs through the northern part of the study area, again with a reasonable flow, and with its tributaries tending to have steeper courses. As with the Teifi, no good low-head sites on the river itself are apparent within the study area, without site visits.

There appear to be two good high-head sites on tributaries flowing south into the Aeron:

Trefilan East on Rhiw Afallen, with a head of around 60m;

Trefilan West on Nant y Fergi, with a head of around 110m.

Recommendations

Next steps in the study are to:

Run the 5 sites named above through HydrA software to estimate the potential generation capacity and annual energy capture.

Discuss with Ymlaen Ceredigion and Transition Llambled whether they or another social enterprise would be keen to explore developing one or more of these sites. If so, help and support would be available through the WAG programme Ynni'r Fro, if likely sites are around 75kW or more. The programme webpage is at <http://www.energysavingtrust.org.uk/Wales/Ynni-r-Fro>

Wind Energy Resource Assessment

Following instruction and discussion with Bob Jacques at Ymlaen Ceredigion, an initial resource assessment for the deployment of medium-scale wind turbines has been completed by Paul Burrell.

The term 'medium' when applied to wind energy development is a slightly loose definition but generally applies to wind turbines that range in scale from 50KW to 850KW. An example of a 50KW machine is the Endurance E3120 with a swept area of 290m² provided by a rotor diameter of 19.2m and a tower height of 25m. Under optimum conditions (on-site wind speed of 7m/s) manufacturers state that this machine is likely to generate 210,000 KWh or 210 MWh.

An example of an 850KW machine is the Vestas E52 turbine with a swept area of 2124m² provided by a rotor diameter of 52 metres and a tower height of between 60 and 86m depending on site conditions. This machine at 7m/s will generate an estimated 2,233,800 KWh or 2,233 MWh.

Medium-scale development is in its infancy across Wales as previous wind energy development has tended to concentrate on multi-turbine 'arrays' that deploy a number of larger turbines (1 – 2MW) up to the commercial scale Strategic Search Areas defined by TAN 8 guidance. The introduction of the feed-in tariff has generated much interest in the medium-scale area, as planning requirements are perceived as being less problematic and the weaker grid infrastructures may be able to accommodate smaller-scale machines without major problems.

The desktop study conducted for Transition Llambled is based on an initial 'first take' basis due to time constraints, and further work is required to ascertain the exact location of suitable sites across the search area defined via the Spatial Plan local 'six towns' hubs for Ceredigion.

This exercise has therefore been used to establish whether further investigation works are warranted.

Findings

In summary the exercise has found that:

The areas directly NW of Lampeter (to a distance of 10km) and also to the SE and E (distance of 15km) offer the best inherent wind resource as detailed by NOABLE online database.

Of these areas, the main bulk of land to the East has a lower population density and possibly represents the better opportunity, although a large percentage of the land is owned by the Forestry Commission and may already be under lease for development.

The land to NW probably has better road access and is nearer the 33kV distribution grid, although careful siting will be required to avoid loss of amenity on local residents living near a potential wind site.

The 33kV grid looks fairly accessible to both areas defined above, but it is noted that connection to this network is likely to be expensive and therefore an uneconomic factor for a medium-scale development to support.

The areas of accessible wind speed appear free from environmental protection which is positive in terms of wind development.

There are no obvious aviation-based constraints to wind development across both areas.

It is estimated that a detailed site search exercise should reveal between five and ten suitable sites for medium-scale wind development in the areas highlighted above. These sites would need further detailed technical investigation to ensure validity. Ecodyfi are able to undertake this assessment and site search exercise under the provisions of the Ynni'r Fro scheme, which aims to support Community Scale renewable energy projects across Wales.

Further work is therefore warranted from our initial findings.

Enquiries about the wind and hydro assessments should be made to the reports' authors:

Andy.rowland@ecodyfi.org.uk,

PaulB@swea.org.uk, 01654 703965. **Ecodyfi /**

SWEA, 31/01/2011

Biogas

With Lampeter town being on the existing natural gas grid, its proximity to potential feedstocks such as farm slurry, it would be worth looking in more detail at the potential for the production of biogas. Once cleaned of impurities (mainly CO₂), biogas could be fed directly in to the grid to supplement domestic heating, or potentially as a transport fuel.

Biogas is usually made from wet biomass, such as animal dung, sewage, food waste or grass, using a process called anaerobic digestion. The feedstock is mixed with water to form slurry and fed into a digester, where microorganisms convert it into methane and carbon dioxide. The methane can then be used in place of natural gas.

209.25 A recent assessment by the National Grid (2009) shows a large potential for biogas in the UK (see Table 8.1). It is estimated that around half (48%) of the current residential gas demand could be met from biogas. This could be extremely useful for urban heating and cooking which biomass cannot sensibly help with as not enough of it could be grown locally. A breakdown of the estimated potential can be seen below. The "stretch" scenario is the calculated technical potential based on both all waste being sorted, and the maximum use of gasification and anaerobic digestion. This produces far higher outputs for the drier feed-stocks.

209.26 The National Grid also provided a "base case" scenario which they feel is more realistic. While there are several exceptions, this generally assumes 50% of available "waste" is sorted.

209.27 In a zero carbon Britain, processes will be more efficient, so the "waste" available for re-use will be lower. There will also be competition for the use of waste to make other products such as biochar. The role for biochar is explained in the Land use and agriculture chapter.

209.28 Food waste will not be available to be made into biomass or biogas since it will be used as animal feed and compost. The current legal and safety issues associated with this re-use can and should be addressed. Similarly, the amount of available manure will be lower as the healthier zerocarbonbritain2030 diet requires less livestock and, therefore, provides less waste. Some biodegradable and wood wastes may also be used to create biochar or wood pellets, which again will decrease their availability for use as biogas. Table 8.2 shows all feedstocks for biochar.

209.29 Making useful energy products from material currently classified as waste is beneficial in terms of reducing landfill and reducing the amount of new material being harvested and refined. In the case of biogas production from waste, the output is a dispatchable fuel which can be used as a core part in supply-side variability management. (CAT,2010, pp 247-8)



Photo: Transition Llambed

Food and agriculture

Zero Carbon Britain (CAT, 2010) recommends an approach based on product switching: reducing livestock farming in favour of vegetable sources of protein. This would reduce greenhouse gas emissions by 60%-70%, as well as releasing land for energy and sequestration crops. Sustainable energy and transport systems discussed earlier result in a further 10% reduction in agricultural emissions. Sequestration crops deal with the remainder by locking up carbon in soils and vegetation.

This approach should give rise to healthier diets, improve food security and absorb residual carbon emissions from other sectors of the economy.

In *Zero Carbon Britain* this is achieved by:

- conserving carbon stores in the land, especially soil, peatlands and woodlands.
- releasing grassland for locking-up (sequestering) carbon and energy crops by reducing livestock production to 20-30% of current production, with the sector shifting from quantity to quality (high value) products
- greatly increasing the production and consumption of crops, particularly plant protein to compensate for the reduction in meat and dairy products

This enables the provision of a healthy diet for the population on 29% of the area currently used for producing food. The strategy for agriculture is critical to reducing overall emissions; sequestration of carbon by farmers takes out some of the CO₂ produced by other sectors of the economy.

This scenario presents several difficulties for the Lampeter area, involving shifting attitudes of consumers, skills and inclinations of farmers and whether the market incentives will apply in the context of the future scenarios we present.

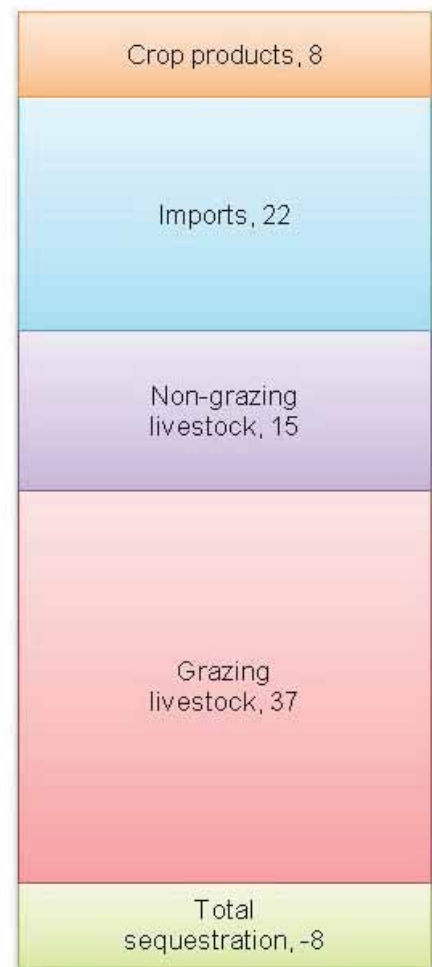


Figure 17. Current emissions from land use and agriculture (Mt CO₂e) (Source: CAT)

By 2060 the world of food and land use is expected to become a very different place compared to today. Six factors are foreseen as a major drivers of this change: ‘

- demographic change’,
- ‘economic growth and changing global economic conditions’, ‘
- climate change’,
- ‘new technologies’,
- ‘societal preferences and attitudes’
- and ‘the policy and regulatory environment’. (Foresight, 2010 and 2011).

Factors expected to influence land use in Wales²²

Demographic change

Growth in demand for land for housing, recreation, transport, water, food and energy. Global population predictions are notoriously uncertain, and depend on many changing factors, one of the most important factors being levels of female education. Current global population of about seven billion is likely to rise to around eight billion by 2030 and probably to over nine billion by 2050 (ibid, 2011, p 14). However, the UN (2004) predicted stabilization at around 9 billion. In one of the supporting papers for Foresight (2011) it is stated that “there is a real chance that global population could fall below its current size by the middle of the next century, even if global fertility levels were somewhat higher than what is being experienced in Europe today” (Lutz, et al). Wales’ population is expected to rise by 11.2% between 2008 and 2031 (ONS).

Economic growth and changing global economic conditions;

Economic growth is predicted to influence the shift in consumption patterns as well as intensifying the demand for land for investment, the demand for additional living space associated with rising incomes, and land for development. Changes in global economy and increase of commodity prices might mean that more land will be brought into food production in Wales.

Climate change

Important role of land in climate change mitigation and adaptation. Land use shifts, changes in settlement pattern and transport infrastructure. Agriculture, forestry and natural habitats seen as vital in offsetting the effects of climate change. Greater competition for land between the renewable energy sector and other sectors (food, industry, infrastructure)

New technologies

Modern technologies will minimise the negative effects of intensive land use and enable its more efficient use. These should be achieved through, for example, ‘precision farming’ or anaerobic digestion.

Societal preferences and attitudes

Land use changes will be directly linked to people’s willingness to protect the natural environment. Decisions related to daily activities on where to shop and what to buy (local or global products) or how to commute will affect the land use patterns.

The policy and regulatory environment

Devolution of EU laws and regulations, and likely increased legislative powers for Wales, mean changes particularly in the agricultural sector related to how sustainably the land resources are managed.

Land services

Land provides ecosystem services (non-priced, hence often undermined); public goods such as carbon sequestration²³, water retention and flood prevention, biodiversity conservation and recreation. It also plays a major role in the food industry and wider economy, and possesses immeasurable cultural and environmental affiliations.

The way land is managed is crucial to achieving sustainability, improving wellbeing, reducing emissions and ending dependency on fossil fuels.

Without land and healthy soils, the food farming and other agricultural activities that take over 70% of Wales’ land area would be impossible (Stern Review). Agriculture provides vital services to the local natural, social, economic and cultural environments as well as “provisioning services”. These are (McIntyre, et al, 2009):

- Food - obtained from plants, animals and microbes

²² Based on Foresight 2010 unless otherwise indicated

²³ carbon sequestration - the “natural process whereby living plants and trees remove carbon from the atmosphere through photosynthesis as they grow” (Stern Review, Chapter 25).

- Feeds- necessary for sustaining life cycles of livestock (for example grass, herbs or cereals)
- Fibre –wood, jute, silk etc.
- Fuel – wood, biofuel plants, crop residues
- Genetic resources – genes and genetic information used for breeding purposes
- Natural medicines, pharmaceuticals and biochemicals.

The food footprint of Wales

Food production and consumption constitutes the second biggest component (after energy consumption) of Wales’s ecological footprint. Food not only requires land but also substantial energy inputs, in farm energy use, chemical and other inputs, cultivation, transport and storage. In Ceredigion the food footprint is around 1.05 gha²⁴/capita (SEI, 2008). This is affected strongly by consumers’ choices of products, such as the type of food stuff chosen, whether it is locally grown or seasonal, and distance to retailers. In 2004 only 24% of food purchased was from Wales (Welsh Development Agency, 2006). More than 60% of vegetables and fruits on the shelves of our shops are imported from overseas (Fairlie, 2007).

Our food system is significantly contributing to greenhouse gas emissions: essentially today we produce food by converting calorific oil and other forms of energy into food calories. In UK agriculture, the highest percentage of the **direct energy use** belongs to electricity (40%) and petrol/diesel (28%). Indirect energy use includes: fertilisers (51%) and pesticides (13%). Other big energy users are tractor purchases and animal feed (Defra²⁵, 2006, p. 46). The importance of fossil fuels to agriculture is undeniable, and so is their contribution to climate change. Methane from agriculture, which is 21 times more potent a greenhouse gas than carbon dioxide (CO₂), contributes to 47% of total UK methane emissions. Methane originates during digestion (by “enteric fermentation”) in ruminant livestock. In total,

²⁴ gha – global hectares

²⁵ Defra - Department for Environment Food and Rural Affairs

greenhouse gas emissions from the agricultural sector account for 7% of the UK’s emissions. According to Wilkinson et al. (2009), livestock production causes up to 8% of UK emissions.

Greenhouse gas emissions arise from fossil fuels used to produce mineral fertilisers and from fertiliser use; methane release from the breakdown of fertilisers and from animal manure; land-use changes for feed production and grazing; land degradation; fossil fuel use during feed and animal production; fossil fuel use in production and transport of processed and refrigerated animal products” (ibid). Increasing emissions also result from the intensification of grain production: compared to 1975, the cereals needs of 14% more people can now be provided on 86% less arable land (Fairlie, 2007).

The potential for land use to reduce carbon emissions.

Foresight (2011) recommends “sustainable intensification” (i.e. getting more produce per unit of land without degrading resources and the environment), with organic farming and genetic modification making appropriate contributions in some parts of the world. Piecemeal changes are not sufficient to meet the challenge; a global approach must be adopted. Modelling the global food system suggests that food security must be tackled on a global scale whilst maintaining food sovereignty for individual nations. Protectionism, or widespread attempts at self-sufficiency, would cause dangerous instability in the system. Countries or regions should concentrate on growing food that is most suited to their conditions, with trade supplying food-stuffs that cannot be produced productively locally. Patrick Holden (2011), one of the contributors to the Land Use Futures Project, argues that the report gives the message to carry on producing food unsustainably. He believes we have 10 years at the most to make fundamental changes, a key change being the localisation of production, not full self-sufficiency, but as much as possible produced as close to consumption as possible. He points out that organic farming can be the “sustainable intensification” called for by Foresight.

The management of land is potentially a major contributor to reducing carbon emissions.

Vegetation, biodiversity and soils are major carbon sinks. When trees are cut down or soils are disturbed the stored carbon oxidizes and escapes back into the atmosphere as CO₂ (ibid).

Competition for land use comes also from the energy sector, increasingly as the UK tries to meet renewable energy obligations by 2020. This necessitates larger areas of land to be devoted to alternative energy production. Growing energy crops on a major scale would add to the burden already placed on land and its resources, and would further exacerbate the food versus fuel dilemma (Foresight, 2010). "Supplying 8-12% of the 2050 energy demand from UK-grown energy crops ... would need up to 25% of the land area" (ibid). This would also compete with other land uses such as recreation, which brings £114 billion per year to the national economy (ibid.). This is particularly important for Ceredigion and much of rural Wales, where tourism is a major economic driver. In 2007 in Wales tourism was worth £4.2 billion, (WEL, 2008).

The Soil Association (2009) details the organic practices that positively affect soil carbon compared to non-organic farming; fertility-building periods in the crop rotation, non-use of inorganic nitrogen fertiliser, a living (biologically active) soil, additions of organic matter, composting and ploughing.

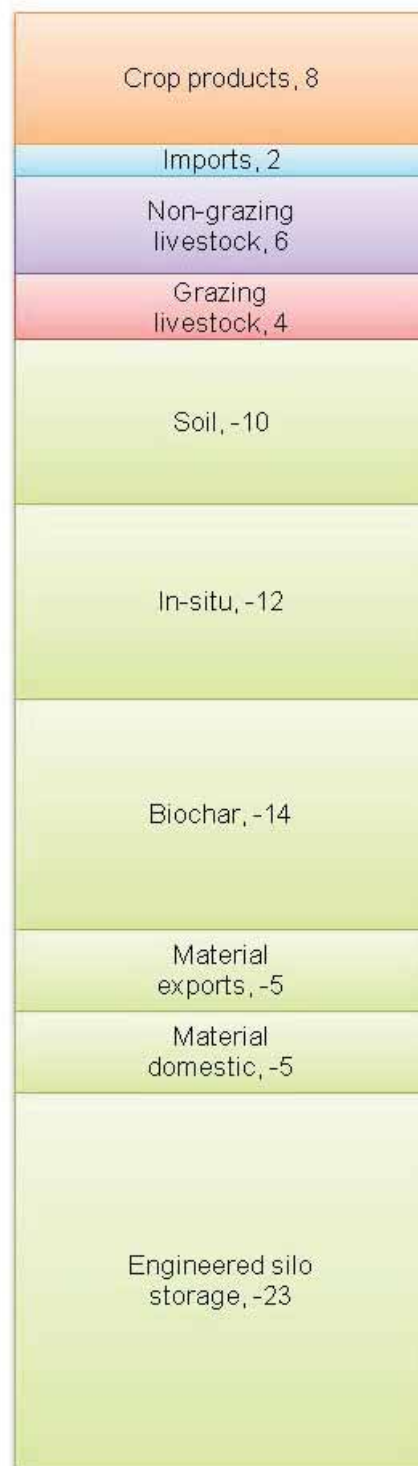


Figure 18. Zero Carbon Britain 2030 emissions from land use and agriculture (Mt CO₂e) (Source: CAT)

The widespread adoption of organic farming in the UK would offset about 23% of UK agriculture's GHG²⁶ emissions...The soil carbon benefit of organic farming offsets 44-72% of the GHG emission of organic arable crops and 29-39% of the GHG emission of organic white meat at least, for twenty years. This means that widespread conversion to organic farming would drastically reduce the GHG emissions of these sectors for at least twenty years. (Soil Association, 2009, p 140).

Less meat and dairy livestock

Less meat and dairy livestock production would also contribute to offsetting GHG emissions. In contrast, overgrazing (too many livestock per hectare) reduces carbon sequestration in the soil. This is due to the reduced growth and deposition of organic matter of grassland, changes in species composition (with a negative impact on biodiversity) and soil erosion (Soil Association, 2009). Permanent grassland has high levels of carbon and the UK's climate is perfect for its production (ibid). Thus a general reduction of livestock numbers accompanied by a shift to grass feeds (replacing energy-intensive grain) would make significant contributions to reduction of emissions from the sector.

Grain (2009) proposes mitigation measures to make agriculture more sustainable:

- Integrated production methods: reintegrate livestock and crops so that chemical (oil-based) fertilisers can be eliminated and natural ones reintroduced;
- This addition of organic matter would help to rebuild the soil, improving the retention propensities of soil and its ability to capture CO₂ emissions from other sectors;
- "Keeping people on the land" which, in turn, will de-industrialise agriculture and save energy. Small-scale family farming is envisaged as the best producing structure in the food system;

- Growing locally is a popular idea that is aimed at strengthening food sovereignty and security, potentially reducing the food miles problem and carbon footprints. Eating seasonal foods would bring further savings;
- Finally, reducing the 'meat economy' and dismantling the 'mega-industrial meat factory system' is a final component of making the food system less emission-intensive.

Can emissions be reduced whilst maintaining the area's livestock farming?

It seems very likely that the volume of livestock production will decrease, alongside consumption of meat and dairy products. The price of fossil fuels (and perhaps carbon), and therefore imported supplementary feeds will make this a necessity. However, a rise in the proportion of local traditional breeds of cattle and sheep raised on permanent pasture with minimal supplementary feeding could result in a high-value market for some farmers.

Graham Harvey (2008) maintains that livestock grazing on traditional permanent mixed pasture can maintain levels of production similar to current average production for all livestock systems in the UK. Harvey also presents evidence that meat and dairy products from such pastures are healthier. It is recognised by many researchers that pasture is efficient at absorbing and locking up CO₂, but Harvey argues that this service can be provided *at the same time* as grazing for meat and dairy production. If Harvey is right then local agriculture could be climate-friendly and continue to produce livestock products, albeit with a shift to more extensive grazing, returning to traditional mixed grass and herb pasture and with much reduced supplementary feeding. At the same time there will be opportunities for farmers to increase the proportion of cropland to meet the growing demand for locally-produced vegetables, grains and legumes resulting from the higher costs of transporting these foods from outside the area.

As food purchasers and consumers, we have to decide which models of future food systems we want to support. Wales, and particularly Ceredigion, can be seen as bridging both the dominant and the alternative systems. The

²⁶ GHG – greenhouse gas

latter could benefit not only Welsh agriculture and farmers, but consumers as well.

Organic farming should be primarily targeted at growing vegetables and fruits. This is because today 60% of all the vegetables and fruit we buy are imported from overseas which tremendously adds to the food footprint. Unfortunately, in the UK their production is declining and in the decade between 1990 and 2000 the area devoted to horticultural production shrunk from 46,700 hectares to 34,200 hectares (Defra, 2006).

Frost et al (2007) show how increasing fruit and vegetable production in Wales would be viable, and even advisable for the economy. Many dairy and beef farmers could consider switching to these crops: increasing food prices provide incentives in this direction. This would strengthen the eco economy of rural Wales and promote sustainable land use. In turn, this approach would encourage new developments on-farm and in the rural economy as shown below (Kitchen et al, 2006).

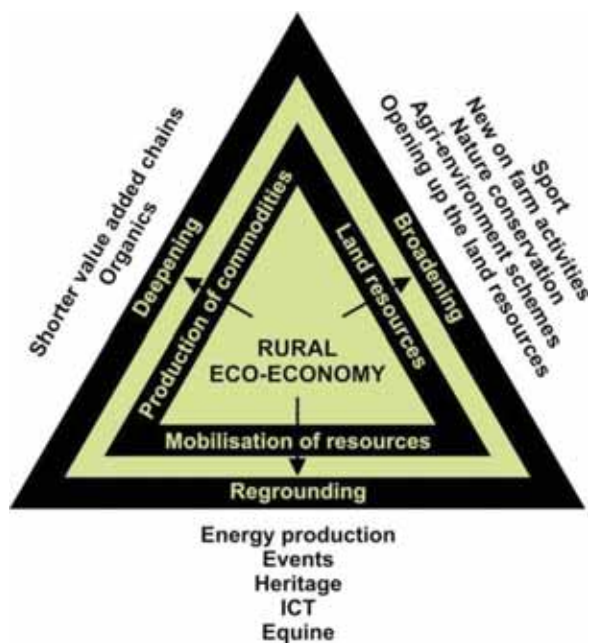


Figure 19. The dynamics of rural development at enterprise level

Home and community grown food, permaculture, agroforestry

These will become increasingly important as innovative solutions are sought for multi-uses of land.

Permaculture and agroforestry offer opportunities to combine food production with carbon sequestration, wood and other biofuels, timber and other products serving growing markets in cosmetics, culinary and medicinal herbs and crafts.

Private gardens and allotments, various forms of community growing and the use of public “amenity” land for producing food will also become important for vegetable and fruit, as well as “backyard” livestock husbandry.

Partly due to food scares, such as BSE, people have started again to become committed to home-grown and organic produce: between 2004 and 2005 this rose by 31% (ibid.). The benefits of home- and community-grown food include:

- a sense of achievement and helps to reduce stress
- gardening can enhance community bonds if this activity is performed in a group
- health benefits associated with consuming seasonal food
- provides better understanding for people how their food came about (Defra)

Smaller-scale ventures in food growing can be pursued through community projects, home-growing, land-sharing or renting an allotment. The Welsh Assembly Government supports the incentives of this sort, precisely those which promote health in individuals as well as whole communities. The Community Grown Food Action Plan (WAG, 2010) stresses that “with obesity rising in Wales it has never been more important for people to eat healthy food and raise activity levels”. Growing food can enhance physical and mental health. Community Supported Agriculture (CSA) gives a unique chance to get the community closer to the source of their food - the farm and the farmer. The farmer might even be paid to help the community by taking control over the land so that crops and land are properly managed and both sides of the agreement are content; farmers could gain an additional income source and communities would get enough fresh fruit and vegetables. Not enough consumption of

these (compounded by excessive consumption of saturated fat and salt) cause 70,000 premature deaths per year (Cabinet Office, 2008). Funding for such community food initiatives could be sought from various sources, including Environment Wales, Tidy Towns, Get Cooking and Local Environment Quality Improvement Grants.

Arnoult et al (2010) looked at the impact that healthy eating guidelines would have on land use patterns and agriculture, using the dietary recommendations of the UK Department of Health. The projections envisaged a decrease in consumption of cheese (up to 80% in Wales), confectionery by 35% and fat by 20%. Consumption of all fruit and vegetable groups was projected to increase by up to 80%. Cereals and bread consumption would also increase. Fruits, vegetables and grains are highly profitable goods on the market. The scenario found that the decrease in the consumption of meat and dairy products in Wales would result in a decrease of up to 50% (450,000 units) in all cattle numbers. The widespread adoption of healthy eating guidelines would therefore be a further incentive for Welsh farmers to consider switching to horticultural production.

Biofuels

Another potential reduction of GHG emissions coming from agriculture could come from alternative sources of energy, such as **biofuels**, which are carbon neutral and which today are mostly obtained from energy crops such as Miscanthus, willow or poplar (Defra, 2006, p. 50). There are also other crops that can help reduce 'on farm' emissions and be used as raw materials for various products, not to mention an additional financial upside for farmers deciding to grow them. Oilseed rape, for example, can be used for the production of biodiesel, and bioethanol can be obtained from wheat and sugarbeet. The reduction of GHG emissions is a crucial target of the Welsh Assembly Government (WAG) which wants Wales to become “**a global showcase for clean energy**” (Technical Advice Note 8, Annex A, p 23, cited in Kitchen and Marsden, 2006) and hence achieve **60% carbon savings** by 2050. Bioenergy was hoped to become an important

contributory source of alternative energy (the main source being onshore and offshore wind turbines) and by 2010, together with other sources, it was to provide 40MW of power (Kitchen and Marsden, 2006). ‘Rural Development Plan for Wales 2007-2013’, (2010) provided an initial scoping study, which indicated that over 9,000 hectares in Wales could be devoted to biomass production. It has also been underlined that there are numerous schemes run by WAG (capital grants for equipment to burn woodfuel, fuel supply development, assistance with planting of Short Rotation Coppice and many others) which should encourage farmers to grow energy crops as financial support will be available. Moreover, the Rural Development Plan for Wales sets out to achieve other targets such as: “setting up of farm management, farm relief and farm advisory services, adding value to agricultural and forestry products, vocational training and information actions for persons engaged in the agricultural, food or forestry sectors, supporting farmers who participate in food quality schemes” and many, many other incentives aimed at helping Welsh farmers (Woodland Strategy Advisory Panel, 2006)

Transition approaches in agriculture in Ceredigion

The drive towards more sustainable food production, reduce greenhouse gas emissions and dependence on fossil fuels, conserve soil and address rising input costs is already apparent in Ceredigion.

Phil and Michelle Drayton of Rhyd-y-Gwin, Temple Bar, own and run a Soil Association-registered smallholding/ market garden on 5 acres of land. They grow fruit, vegetables and herbs as well as lamb, pork, eggs, preserves and honey. Many of the features of the smallholding give multiple returns and benefits. Manures are collected, composted very quickly and returned to the land. They use virtually no farm machinery, are installing renewable energy and harvest rainwater for irrigation. They produce a wide variety of food all year round to supply a vegetable box scheme, Farmers' Markets and Farm Gate sales for local customers, at prices that compete with supermarkets. Transition Llambled, Newsletters, October 10, <http://www.transition-llambled.org.uk/default.aspx?page=190>

Peter Segger and Anne Evans have run the 45 acre Blaencamel Farm in the Aeron Valley for more than 30 years, producing organic vegetables and salads. Recently installed solar PV panels produce electricity for the extensive irrigation system, as well as supplying the farmhouse and other food operations. They hope to convert their diesel tractor to run on renewable electricity. Crucial to the farming system is composting and good soil husbandry. This has led to there being no requirement for outside inputs for the last 15 years, and a farm that is not only carbon neutral, but becoming carbon negative (ie it absorbs more greenhouse gases than it emits). <http://www.blaencamel.com/>

Trends in livestock farming also hint at transition. Farmers are increasing the amount of their own feedstuffs to reduce the need to buy in feed. Some farmers are also reducing the need for supplementary feeding by extending the period of grazing as far as possible. This is helped by the use of breeds, such as the Welsh Black, that are well adapted to local conditions, capable of flourishing on poorer pasture and have less need for supplementary feeding. The Institute of Biological, Environmental and Rural Sciences (Aberystwyth University) is supporting these trends by working with farmers and trialling new approaches <http://www.aber.ac.uk/en/ibers/>.



Photo: Elzbieta Kruger

Working together for sustainable change

I think there are good reasons for suggesting that the modern age has ended. Today, many things indicate that we are going through a transitional period, when it seems that something is on the way out and something else is painfully being born. It is as if something were crumbling, decaying, and exhausting itself—while something else, still indistinct, were rising from the rubble. Source: Václav Havel, playwright and Czech president (Scharmer, 2009, t. 1).

What can Transition Llambed and other groups concerned with sustainability do in the face of a possible (likely) lack of the significant funding that will be required to implement the physical and service-based changes we have outlined? How can we move towards a low-carbon, low fossil-fuel local economy in a future scenario (Local Stewards) that lacks support from central or local government?

The answer lies in what is perhaps the biggest challenge: the task of engaging people to adopt the transformation in their lives that is necessary to respond to crises in a positive and personal way.

Using a range of carefully selected and proven methods of enabling changes in behaviour, linked to promoting a shift in personal values towards sustainability, a great deal could be achieved for relatively little financial investment.

The difficulty is that choosing the right strategy is crucial and fraught with potential dangers that, if not addressed, could scupper well-meaning attempts at positive behaviour change.

Very broadly, strategies for achieving lasting behaviour change towards sustainability could be put in three groups. These are (1) information-based campaigns, (2) social marketing and (3) values-based “identity campaigning”. Often these approaches are used in various combinations in a single campaign.

Information-based campaigning is still prevalent amongst many activist and campaigning organisations. It tends to rely on simply

providing information to the target audience, sometimes with disaster scenarios or disturbing images. The assumption is that in the face of the evidence, e.g. that climate change will have severe consequences if we do not change our ways, people will change their attitude to the issue and that this will lead to them adopting a range of recommended behaviours, e.g. turning out the lights when leaving the room, or not flying off on holiday. Unfortunately research into the impacts of such approaches shows that generally they are not effective. Nor does the evidence support the assumption that adopting one sustainable behaviour makes people more likely to adopt another. Moreover the idea that “every little helps”, combined with the suggestion that we just need to make small changes that won’t have too much of an impact on our lifestyles, is not going to achieve the major changes required – “if everyone does a little, we’ll achieve only a little” (WWF, 2009).

Social marketing

Social marketing, particularly “community-based” social marketing, is regarded by many as a more effective way to change behaviour towards sustainability. These kinds of approaches use methods akin to those of the marketing and advertising industry to appeal to people’s self-image. The idea is to persuade a particular social group to adopt a specific, more sustainable behaviour that will enhance their sense of self-worth. Community-based social marketers recognise that information-intensive campaigns, appealing to solely to financial self-interest or self-preservation through fear of the future, are often not effective techniques for changing behaviours.

Detailed studies of community-based social marketing approaches suggest that they can be highly successful in promoting specific ‘pro-environmental’ behaviours (McKenzie-Mohr, 1999).

Community-based social marketing is a useful tool: it has been shown to work, and it is based on an understanding of human psychology. One

problem with the approach is that it is piecemeal (very specific behaviours are addressed, rather than values), hence significant, long-lasting results in addressing broad issues such as climate change or peak oil could only be achieved by addressing a whole host of individual behaviours. The other main problems are that community-based social marketing can inadvertently strengthen consumerist or materialistic values that are unsustainable in the long term, and is at least unlikely to confront the underlying issues directly.

Identity campaigning

Identity campaigning is an emerging response to the past ineffectiveness of much environmental campaigning. It is based on psychological research in to people's sense of who they are and their competing value systems. Identity campaigning is being led in the UK by WWF (Compton and Kasser, 2009).

The key strategy for groups promoting sustainability, like Transition Llambed, is to ensure that in encouraging sustainable behaviour they do not inadvertently reinforce (*extrinsic*) values that are in the long term environmentally damaging, such as appealing to materialistic goals or social status. At the same time such groups need to promote (*intrinsic*) values that enhance people's feelings of connectedness with the environment, community and their inner selves.

Groups also need to act in partnership to challenge and influence local and national policy as well as the marketing messages of the commercial sector. Government policy subtly influences citizens as to what is expected of them and the kinds of goals and behaviours that are valued in society. The drive for economic growth based on unsustainable consumerism is a cornerstone of government policy, which inevitably sends out the message that materialist values are to be encouraged. In the commercial sector large sums of money go to the advertising and marketing industries, who blatantly promote extrinsic values like materialism, status and image, which are directly opposed to sustainability.

Leadership for sustainability

Similarly, we need to influence the whole spectrum of organisations that themselves influence prevailing policy and culture, from local community groups, schools and colleges, to business and large public bodies. It is not necessary or helpful to be confrontational when working with other organisations. Through introducing 21st century change-management ideas, such as "Presencing" and "Theory U" (Scharmer, 2009), "Immunity to Change" (Lahey, 2010) and "Mindfulness", leaders can be trained in practical techniques for creating positive changes towards sustainability. Such techniques are based on sound eco-psychological principles, an awareness that organisations are influenced by, and have influence over, global challenges, and that people are the agents of change. Many of these change-management tools are becoming increasingly accepted and sought after by the corporate world, as well as the public sector.

"Identity" is people's sense of themselves, or who they think of themselves as being. Three aspects of human identity affect how they respond to environmental challenges: these are their values and life goals, perceived "in-groups and out-groups" and how they cope with fear and threats.

Values and life goals relate to what is felt to be desirable and worth striving for. Research shows that the relative importance people place on material wealth and status are generally associated with more negative attitudes and behaviour towards the non-human environment.

A person's perceived in-groups and out-groups, i.e. their social identity, or the groups to which people feel they belong, can lead to a perceived split between humans and non-human nature. People who see the wider environment as the ultimate out-groups can result in an indifference to the destruction of other species, ecosystems and natural resources. This prevents a strong connection to nature, which can be shown to be associated with positive behaviour towards the environment.

How people try to cope with fear and threats to their existence, self-esteem or the integrity of their identity also affects behaviour. Such threats tend to cause emotional problems like anxiety and guilt. To protect themselves psychologically, people adopt a range of coping mechanisms. Some people may embrace more sustainable behaviours, but many will subconsciously seek to minimise the perceived threat, pursue diversions, strive even harder for materialistic goals or shift the blame to other groups outside their own.

It is important to realise that these psychological aspects of identity exist in all of us, but are more prevalent in some than others. To deny this puts us in danger of re-enforcing our own “in-groups” vs “out-groups perceptions”.

Moving from ego-system to eco-system working – Presencing and Theory U²⁷

Problems cannot be solved at the same level of awareness that created them. Albert Einstein (1879-1955), from Inc Icon, p 1.

Scharmer (2009 and 2010) proposes techniques designed to enable leaders to address the challenges of the multiple crises facing humanity. In this context, “leader” is not used in a hierarchical sense, but can refer to anyone, or any group, that is trying to bring about change at whatever level. How can leaders achieve a state where they can intuitively and deeply understand the multitude of factors that relate to decision-making and act appropriately?

Rather than the accepted model of learning from the past, the global challenge requires us to “learn from the future as it emerges”. In a process that moves from applying existing frameworks to situations, through observation to retreat and reflection, a deeper inner knowledge can emerge. From here the leader can act decisively because they are leading from their “authentic self”. *Presencing and Theory U* enable people to harness and coordinate the collective creativity of their groups.

²⁷ See also <http://www.presencing.com/presencing-theoryu/> for a brief introductory video clip

These ideas can be applied to how individuals and groups interact – their conversations and power relationships. The first stage is very much ego-centric – “I-as-me”, where the individual or group sees only its own viewpoint. The next is debate – objectives focused, but still from a point of view of opposing entrenched positions – “I in it”. The third stage is more meaningful dialogue – a higher degree of self-awareness and willingness to take account of others’ views, and seeing oneself in the context of other people – “I-in-you”. The fourth stage is collective creativity; connecting to emerging future possibilities, being open to new ideas and new ways of working, and being able to act on these in the present.

At an organisational level, the first stage of evolution is the “machine bureaucracy”, where the source of power resides at the centre, and activity is focused on bettering the organisation for its own sake. As the organisation grows, it tends to become more decentralised: clients or users have more influence on it. Increasingly organisations are evolving in to another form of working, the network form of organising, where much power resides outside the organisation. The last stage is “ecosystem organising” – a form that currently exists only rarely, if at all. All players or stakeholders are involved. The organisation co-evolves with the ecosystem around it. For example, in a food system, all players along the value chain - smallholders, farmers, wholesalers, retailers, caterers, consumers etc – would be involved in co-ordinating the activities of the organisation.

Similarly these ideas can be applied at the level of global action (whether literally at international level or in the holistic development of local communities). How do we coordinate the whole? How does the behaviour of individuals relate to the whole system? This is the big problem that must be solved in a globalised society.

The first stage of evolution of global organisational systems is hierarchy, expressed through regulation by government. The second stage is the market system and competition – a more decentralised way of coordinating the system. The third involves stakeholders

networking and negotiating between organised interest groups. The fourth stage hardly exists at present; but we need it desperately. Here the whole system is taken in to account, emerging futures are understood and action is taken in the present to promote desirable futures or prevent the undesirable. People, governments and business pull together. Scharmer calls this “awareness based collective action”. This is seen partially in responses to immediate crises, such as the 2008 financial meltdown, where the G8 suddenly became G20: governments acted to address the failing system (albeit unfortunately only in terms of unsustainable growth economics) by drawing in emerging economic powers, acting from a shared awareness and creating new ways of co-ordinating. Awareness based collective action is needed urgently to address climate change, peak oil, and the other

crises described in the introduction. Unfortunately that is clearly not happening yet.

Moving from, for example 19th century capitalism (the second stage of organising society above) to 20th-century social market economy (the third stage) required a whole range of institutional innovations, such as unions, health and safety, social security, banking regulations, protection of agriculture and the countryside. Similar levels of major institutional innovation are needed now in order to achieve the awareness based collective action way of organising.

The point for the Lampeter area is that awareness based collective action is vital to ensure solutions that work, are feasible for a diversity of groups, and can be put in place without increasing inequalities.

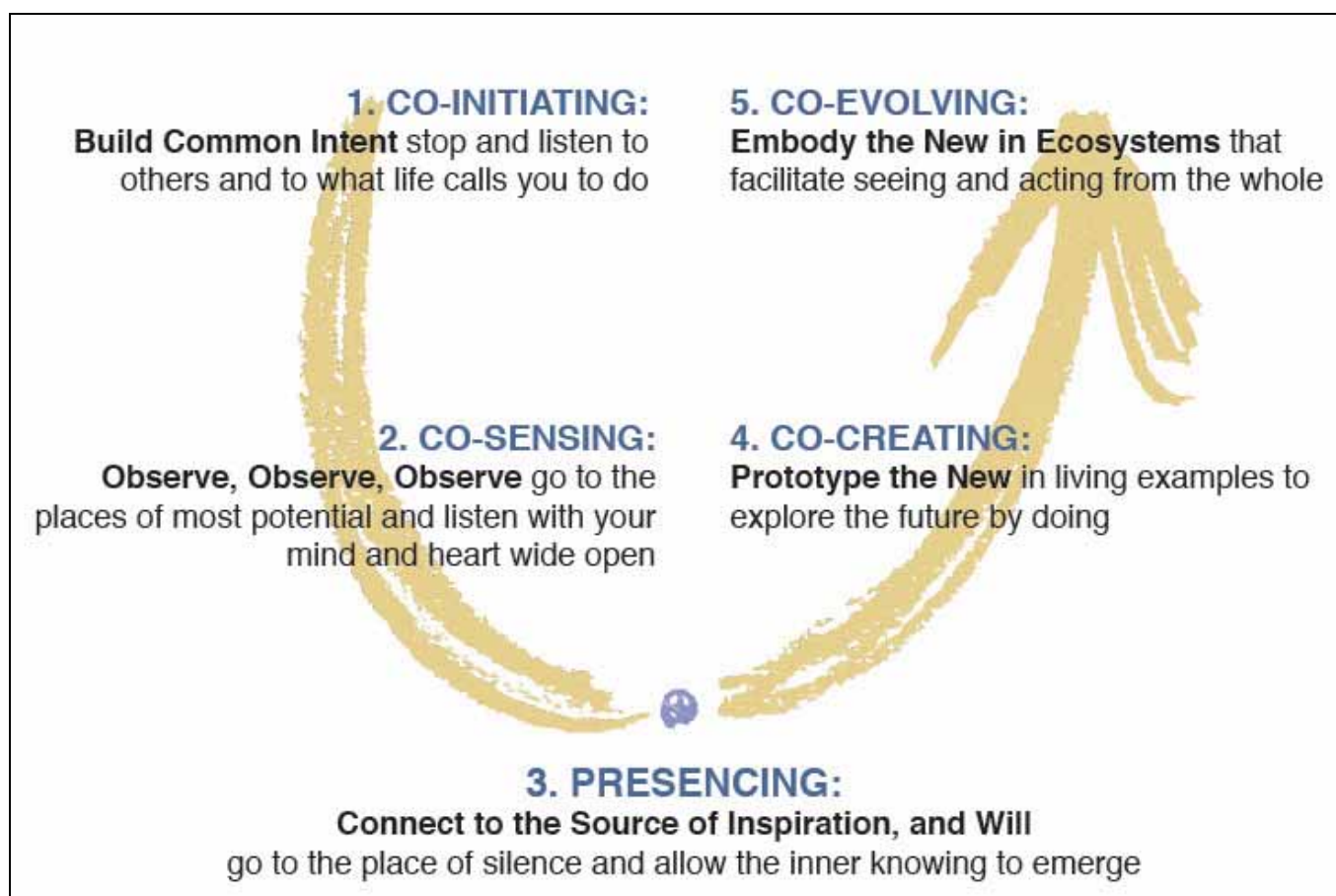


Figure 20. “Theory U” (Source Scharmer)

Work in the field of climate change is especially characterized by uncertainty, pressure to perform and complexity. ... leaders in the climate change sector need special leadership qualities if they are expected to be “hurdlers” as well as complexity managers, system thinkers and networks at the same time ... in the international debate on management and leadership no one is sure any more about what skills these could be ... Three things are relevant for leaders who work in complex fields such as climate change: focus on meaning, mindfulness and learning from the future. (Mercker , 2010)

But surely you can't change human nature?

This is often offered to explain why people do not accept the need to renounce the consumerist ideal and embrace sustainable living. However, both anti- and pro-sustainability values exist in all of us, so it is not a question of changing human nature, but of enhancing our intrinsic values while diminishing our extrinsic ones.

The runaway consumerism that underlies much of the environmental degradation, social fragmentation and local economic decline is a relatively recent phenomenon. The origins of consumerism lie in a proactive policy of marketing to make consumerism almost a religion. “Our enormously productive economy ... demands that we make consumption our way of life, that we convert the buying and use of goods into rituals, that we seek our spiritual satisfaction, our ego satisfaction, in consumption.... we need things consumed, burned up, replaced, and discarded at an ever-accelerating rate”. This policy was expounded by Victor Lebow in the 1950s (quoted in Helm, 2002).

Furthermore there is evidence that, paradoxically, over time humanity has actually become more empathic with nature. Thomas (1984) traces a growing enlightenment in the way society from 1500 to 1800 viewed its connection with the environment. There has been a progression from absolute human ascendancy, uniqueness and dominance over nature, to recognition of “the human dilemma: how to reconcile the requirements of civilization with the new feelings and values which that same civilization had generated”. This can give us hope that this progression is continuing (concern for and interest in the natural world is growing), even though our collective behaviour

does not match an increasingly enlightened attitude to the environment.

In conclusion, we suggest that ritual consumerism, and the view that we are separate from nature and each other, can be turned around by working to shift values from the extrinsic (materialist, anti-sustainability) to the intrinsic (connectedness, pro-sustainability), combined with the right kinds of community-based social marketing.

We must focus on creating a supportive framework for collective progress, rather than exhorting individuals to go against the grain. This is the approach that we heard time and again in our engagement with consumers and business – encapsulated in the notion of ‘I will if you will’ (Stevenson et al, 2006),



Photo: Transition Llambed

Recommendations - A transition pathway

The priorities and ideas set out here do not set out an action plan with detailed dates, costs and targets. Rather, we present a way forward that will need to be revisited, updated and revised as each step becomes clearer. In terms of the awareness of the need for transition amongst local people and organisations, as well as the development of the transition movement, there is not yet the capacity to set out a detailed action plan. The process of researching and compiling this report has shown that the members and associates of Transition Llambod are keen to move forward with practical actions, but currently have little appetite for the overall energy descent planning process.

Economy and services

Based on the principles of the cradle-to-cradle economy and service provision, the short-term need is for inclusive activities that are of immediate practical relevance to local people. This will have the added benefit of drawing in people other than those already engaged with transition issues, and embedding Transition Llambod firmly in the culture of the area.

It seems clear that Victoria Hall in Lampeter should be the focus for activities, now that Ceredigion County Council has transferred the lease to Transition Llambod.

Activities already under consideration include:

- The people's market
- Provision of premises and meeting places for local businesses and community groups
- Holding events and meetings relating to local development in the context of transition.
- In order to gain best benefit from the Feed In Tariffs, installing renewables such as photovoltaics should be pursued urgently.

Serious consideration should be given to introducing a Time Banking scheme attached to Victoria Hall, where time credits are given in

payment for volunteer help, to be spent on using the services provided by the hall. As the scheme develops it could be extended to other areas of activity, acting as a real stimulus to the local economy.

In the medium term, Victoria Hall could become a transition show case demonstrating a range of sustainability measures such as energy-efficient, sustainable refurbishment and renewable energy technologies. As the Renewable Heat Incentive Scheme²⁸ comes on stream in April 2011, installing biomass heating or an air-source heat pump in the hall could be considered. Though addressing the energy efficiency of the building is likely to be the first priority.

28

http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/policy/incentive/incentive.aspx

Victoria Hall as a focus for local economic activity

The Victoria Hall is intended to be a footprint for Transition Llambled in Lampeter. We wish to promote the ethos of Transition in all that we do. For example, what we purchase, what we sell, the suppliers and providers that we use. We intend to promote local food, products and enterprise. We have the opportunity for it to be an education, display and advice centre for the latest developments in renewables, an outlet for sellers of alternative transport. eg electric bikes Energy saving devices and products A place to gather for all Transition events and meetings.

However is is anticipated that the greatest impact that we can make will be through the engagement of the broader community who may not yet be aware of motivates and drives the movement. We hope to attract, and we have had strong indications that we will, a wide range of users from the existing groups in Lampeter. In this way we will make the Hall part of the fabric of Lampeter again and the Transition ethos will be a subliminal backdrop to the venue. Part of our plans are to provide office space or perhaps "hot-desking" for small business and other established public services that need a venue in Lampeter. We hope to increase the number of people using Lampeter as their Market Town again. We have secured the support of the Town Council, the Chamber of Trade, Co-op Wales, and the Development Trust Association of Wales. A Development Trust has been formed along the lines of a social enterprise so that we have a legal status that grant funding providers will recognise. We are in the final stages of negotiating a 20 year lease of the Hall with the Ceredigion County Council. A Victoria Hall Group meet monthly to develop the project.



Victoria Hall (Photo: Transition Llambled)

It is important that initiatives to support the local economy are applied throughout the transition area, not just in Lampeter. In the short term, on way that this can be encouraged would be by promoting the People's Market and other Victoria Hall services widely in the rural areas. However it is essential to step up the dialogue with mainstream businesses in all sectors throughout the area, together with relevant public and third sector organisations in order to develop an inclusive and coordinated way forward. Models for economic and social cooperation, such as the Cambrian Mountains initiative²⁹, the Dyfi Biosphere³⁰, Tregaron Renewal Area³¹ and the Wales Alliance for Citizen Directed Support³², could inform this process.

Reducing our energy needs

Energy efficient buildings

A local, community-owned ESCO is established that would run a PAYS scheme to enable large-scale refurbishment programmes throughout the Lampeter area, prioritising those areas where the most gains can be made. The ESCO would increasingly supply locally produced renewable energy, source installers, labour and materials locally, and use Time Banking where appropriate. This approach would not only improve energy efficiency but also be a major contribution to the local economy.

In rural areas not supplied by natural gas, the predominant heating systems should be based on heat pumps, supplemented by solar hot water.

In Lampeter, older gas central heating boilers should be replaced by condensing boilers, in the expectation that fossil fuel natural gas will gradually be replaced by biogas produced by anaerobic digestion.

²⁹ <http://cambrianmountains.co.uk/>

³⁰ <http://www.biosfferdyfi.org.uk/>

³¹ <http://www.ceredigion.gov.uk/index.cfm?articleid=15110>

³² <http://wacds.org.uk/>

Wood and other biomass should be used sparingly as a fuel, as these are best used as construction materials (or left alone), thereby sequestering carbon and contributing to the reduction of CO₂ in the atmosphere. It may be appropriate to use biomass as a means of producing biochar, or in CHP plants in industrial applications that require high levels of heat. Such processes could be combined with small-scale, or farm-scale, district heating schemes.

Promote smart metering and plug-in energy monitors as ways of making it easy for people to be more aware of how much energy they are using.

Alongside this approach we need targeted education and social marketing programmes that help people understand the benefits of low-carbon homes and promote sustainable behaviour.

Transport

In the short term at least, the availability of energy efficient electric cars is unlikely to be influenced by local initiatives. However, schemes such as cycle hire, conversion of pedal cycles to electric bikes, could be established fairly quickly. Similarly an electric minibus scheme could be implemented locally (such a scheme was trialled by Cambrian Energetics³³, Cwmystwyth).

For Transition Llambled, promoting changes in behaviour that reduce the need for and improve the efficiency of conventional private transport is likely to be a priority. Working with CAVO³⁴ to establish community transport schemes will be important, as will dialogue with planning authorities, retailers, employers, health, transport, education and other public service providers, to encourage development in locations that require minimal private transport for access.

³³

<http://www.cambrianenergetics.org.uk/english/index.html>

³⁴ http://www.cavo.org.uk/index.php?option=com_content&view=category&layout=blog&id=8&Itemid=14&lang=en

Renewable Energy

The priority is to pursue the assessments of community hydro and wind potential outlined above. This is urgent in view of the time it can take to implement such schemes, the likelihood that the Feed In Tariffs will be reduced in 2012, and end of the Ynni'r Fro scheme in 2013.

If one or more community renewables scheme can be implemented in the near future, income could be generated for further transition projects, as well as for local people and organisations in the form of returns on share offers. The income could contribute to the establishment of a community ESCO with a PAYS scheme to begin the enormous task of making existing housing stock more energy efficient. However, in the shorter term, income from the first community renewables schemes might be better invested in the sustainable refurbishment of Victoria Hall, and implementing further community renewables to increase the amount of income available for reinvestment in other projects.

Establishing the priorities, phased implementation and financing of renewable energy provision for the area as a whole will require further detailed studies of feasibility. A first step would be to continue dialogue with the Ynni'r Fro team.

As the number and capacity of renewable energy installations increases, and reliance on fossil fuel-generated electricity and heat decreases, it will be necessary to consider:

- Is it really feasible (or desirable) for the Lampeter area to be self-sufficient in energy (as in the Local Stewards future scenario)? This will require considerable consensus-building amongst communities, local government and business.
- How to engage the public and communities in the “wicked issues” surrounding renewables, particularly in the case of wind. Emphasising and proving the economic and social benefits to local communities is likely to be the key in this respect.

- The local electricity grid and the requirements for upgrading the network and developing microgrids to cope with the wide range of generation capacities involved.
- Where and how to introduce pumped storage capacity. This will be required to cope with fluctuations in supply and demand of renewable electricity, if the transition area is committed to aiming for self-sufficiency in energy. Pumped storage is likely to have considerable negative environmental and social impacts if it requires the creation of a new reservoir.

Food and Agriculture

There is a danger in the transition movement as a whole of alienating conventional farmers by over-emphasis of reducing livestock production. This tends to occur because of the greenhouse gas reductions that can be achieved by reducing the amount of livestock, the greater efficiency in terms of the amounts of protein produced per unit area by crops over livestock and perceived animal welfare considerations. These are sometimes combined with desires to promote vegetarianism or veganism.

Instead, an a more positive approach to adopt would be one that focuses on the common ground that clearly exists between the goals of traditional family farming, local food chains and culture, rural development, transition, and addressing climate change.

Some of these are identified as follows (Lang and Heasman, 2004, p. 193):

- Localisation (*versus* globalisation),
- short trade routes (fewer food miles, lower emissions),
- food from own resources (*versus* import/export model of food security),
- extensification of livestock farming (*versus* intensification),
- renewable energy and energy crops,
- multiple players in each food sector,

- a vibrant rural population (*versus* a declining rural population),
- biodiversity and environmental stewardship (including benefits to tourism),
- mixed farming (or “multi-functional” agriculture)
- organic farming (intensive where appropriate),
- indigenous knowledge,
- food that is fresh, in-season and from the land (*versus* food from factories),
- local markets (*versus* supermarkets),
- skilling (*versus* de-skilling),
- diversity (*versus* standardisation),
- real variety on field and plate,
- local distinctiveness, (local food specialities, slow food, bio-regionalism *versus* food from anywhere),
- local decisions, bottom-up control, self-reliance, social inclusion and food democracy.

An urgent priority for Transition Llambod would seem to be to extend the group’s contact with the farming community and organisations that support agriculture and rural development, using common ground as a focus to introduce and discuss transition priorities. In this way a consensus on the way forward for food and agriculture might be developed.

At the same time practical initiatives such as the People’s Market, allotments, community growing and land-sharing schemes could be pursued in the near future.

Working together for sustainable change

Dialogue and engagement with a number of sectors has already been mentioned above. In the short to medium term a major challenge for Transition Llambod is to encourage people, communities and organisations to shift towards sustainability in behaviour, attitudes and values. This of course has begun already, but needs to

be sustained, become more inclusive and use techniques that are effective and appropriate in different circumstances and in different sectors.

The goal here is to achieve a state of “awareness based collective action”, rather than trying to scare people in to changing by bombarding them with the negative impacts of peak oil and climate change (undoubtedly serious though they are). The preferred approach would seem to one that uses a combination the techniques summarised in section *Working together for sustainable change*, rather than more traditional information-based campaigning:

- social marketing – applied with care, ensuring that such campaigns do not inadvertently reinforce unsustainable values systems, and only if sufficient social science, marketing and data-handling expertise is available
- identity campaigning – to encourage shifts in values towards pro-sustainability
- change-management techniques in relation to sustainability – such as Presenting, Mindfulness and Immunity to Change – to help foster leadership, at whatever level, for transformation.

The age of cheap oil is over

On 9 November 2010, the International Energy Agency (IEA) published its *World Energy Outlook*. The IEA states that “**the age of cheap oil is over**”. It suggests that even if international energy policies act to address security of supply, the IEA shows conventional oil production to be static to 2035, and much of that production is based on “fields yet to be developed or found”. Demand for oil is expected to continue to rise dramatically.

The IEA gives a clear signal that the basis of the global economy, the supply of cheap oil, is in jeopardy.

Similarly, reports on the extent and impacts of climate change, loss of natural habitats and food security look ever more desperate.

We must not fall into the trap of despair; we must act now to work towards a better future, where local resilience and self-reliance builds communities that can withstand the coming oil shocks and the environmental, economic and social consequences of climate change.

It is by no means certain that governments will act in time to avert multiple crises. The Lampeter area, together with other communities, must be able to act even in the absence of outside help.

From a technological point of view, the solutions outlined here are achievable. It should be possible for renewable energy, combined with increased energy efficiency, to power a locally-based, sustainable economy. It should be possible for the majority of essential foodstuffs and renewable resources to be produced locally.

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