

# Carbon Reductions in Herefordshire; Opportunities to Learn from Global Best Practice

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## Preface

The transformation to a low carbon economy is necessary, possible and desirable. Necessary because the future of human civilization depends on a stable climate, atmospheric CO<sub>2</sub> levels are rising fast as a result of human action and must be reduced in order to mitigate the effects of climate change. Possible because there are other ways of doing things in every field of human activity from how we feed and house ourselves to how we organise and move ourselves about that are either more energy efficient or have lower CO<sub>2</sub> emissions. Desirable because many of the new ideas and technologies for combating climate change can also solve multiple other problems and create new opportunities for economic growth and a better quality of life. By working together the Council, communities and companies of Herefordshire may find much common ground and a new spirit of unity as they rise to the challenge of our era.

The 30 Inspirations are drawn from research into best practice in carbon reduction across the world. They are selected on the basis that as well as achieving Climate Change Mitigation, they create new opportunities for green jobs and solutions to other social, economic and ecological problems. The examples are chosen for their applicability for Herefordshire. So many of the most inspiring examples of climate change mitigation, such as the amazing reforestation in Burkina Faso or developments in wave and tidal power are not mentioned. I have selected a range of different ideas, projects, technologies and developments, some easy and quick to implement, some more challenging; some requiring considerable investment, others cost free. Some of the 30 are seemingly insignificant (such as signing-up to 10/10/10) and are included because of they give Herefordshire Partnership an easy and low cost opportunity to express a desire to be at the forefront of change, others such as supporting the Leominster Anaerobic Digester because it offers a model that could be much replicated.

The brief for this assignment was to conduct a review of global best practice in climate change mitigation and to produce a document which set out a number of proposals for how this learning could inform future action and policy in our county. The proposals contained within it need to be further developed and added to, but they do indicate a possible low-carbon development scenario for Herefordshire.

I am happy to explain, expand and develop any or all of these proposals. (I assert copyright but grant permission to copy.)

Richard Priestley

April 2010

## 30 Inspirations 30 Proposals

Theme	No	30 Inspirational Projects: Global Best Practice	30 Proposals for Herefordshire	How does this save CO <sub>2</sub> ?
Visionary Planning: Setting Goals, and making the transition from fossil fuels to renewables.	1  S.7 <sup>1</sup> pg 18	The island of Samsø, Denmark, in 1997 set itself the visionary goal of transforming its economy to be powered by 100% renewable energy in a decade. By 2007 it had achieved this challenge, gaining global recognition <sup>2</sup> .	If Herefordshire Partnership set very ambitious targets for CO <sub>2</sub> reductions (100% by 2030 or 2040?) it could attract much help, support and interest from around the world.	Samsø has done detailed analysis of reductions of several forms of pollution, including CO <sub>2</sub> . It can be said that the island is now carbon negative due to wind energy exports to the mainland <sup>3</sup> .
Visionary Planning: Setting Goals, and making the transition from fossil fuels to renewables.	2  S.7 pg 18	The Spanish electricity generation industry is leading the World in terms of making the transition from Fossil-fuels to Renewables. Solar <sup>4</sup> and wind <sup>5</sup> are expanding rapidly, with hydro, geothermal and biomass all playing a role. Nuclear power, though still important, plays a diminishing role.	It would appear that the era of cheap fossil-fuels is drawing to a close. Future technologies are unknown, but it is predictable that renewable forms of energy will become ever more important. It is proposed that Herefordshire Council make a public statement to the effect that the transformation to a post-fossil-fuel economy will become a central aspect of policy and planning	Huge reductions of CO <sub>2</sub> emissions are required to meet climate change mitigation targets. The transition to an economy based largely on renewables is necessary, possible and desirable. If we manage this transition well there will be many social, economic and ecological benefits. Herefordshire could have the capacity to generate significant amounts of energy.

<sup>1</sup> These refer to sections in the report following this table

<sup>2</sup> [http://www.energiakademiet.dk/images/imageupload/file/UK/RE-island/10year\\_energyreport\\_UK.PDF](http://www.energiakademiet.dk/images/imageupload/file/UK/RE-island/10year_energyreport_UK.PDF)

<sup>3</sup> [http://www.energiakademiet.dk/images/imageupload/file/UK/RE-island/10year\\_energyreport\\_UK.PDF](http://www.energiakademiet.dk/images/imageupload/file/UK/RE-island/10year_energyreport_UK.PDF) see page 50

<sup>4</sup> [http://en.wikipedia.org/wiki/Solar\\_power\\_in\\_Spain](http://en.wikipedia.org/wiki/Solar_power_in_Spain)

<sup>5</sup> [http://en.wikipedia.org/wiki/Wind\\_power\\_in\\_Spain](http://en.wikipedia.org/wiki/Wind_power_in_Spain)

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Visionary Planning: Setting Goals & Radical Co- operation across Europe.	3  S.9 pg 26	The Aalborg Commitments <sup>6</sup> originated in the Danish City of Aalborg in 2004, and have since been signed by over 620 cities and local authorities. These 10 commitments provide sustainability goals and methodologies to track their achievement. Hampshire County Council <sup>7</sup> is following this path to greater social and ecological responsibility to much acclaim. <sup>8</sup>	Join the growing movement of leading local government across Europe and sign-up to the Aalborg Commitments. This would help facilitate the kind of culture change within local governance that is required.	Initially the CO <sub>2</sub> savings would be modest but grow significantly as the methodology becomes embedded and the culture of local governance evolves. Potentially huge CO <sub>2</sub> emission reduction plus numerous other benefits over the coming years.
Visionary Planning: A Grassroots Community Initiative.	4  S.9 pg 26	The Transition Towns movement is a grass roots community led initiative to envisage life in a post fossil fuel world, and work towards making that vision a reality. Totnes <sup>9</sup> , Forest Row <sup>10</sup> and many other communities in the UK and elsewhere are developing “Energy Descent Action Plans” in order to think about and plan a future that uses less energy.	Work on practical CO <sub>2</sub> reducing initiatives with the growing number of community groups across the County of Herefordshire who are linking into a network called “Herefordshire in Transition Alliance”	Community involvement is important to many aspects of CO <sub>2</sub> reduction, and the Transition Movement provides the Council with a partnership shows how various groups can work effectively together. Through <a href="#">New Leaf</a> a good start has been made in this regard.

<sup>6</sup> <http://www.aalborgplus10.dk/>

<sup>7</sup> <http://www.hants.gov.uk/decisions/decisions-docs/060724-cabine-R0717103452.html>

<sup>8</sup> <http://www.idea.gov.uk/idk/core/page.do?pagelid=8748477>

<sup>9</sup> <http://totnes.transitionnetwork.org/EDAPwebversion>

<sup>10</sup> <http://transitionforestrow.ning.com/notes/EDAP>

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Sign-up with 350.org for international action on 10/10/10	5  S.9 pg 27	A global day of action on Climate Change is planned for 10/10/10 <sup>11</sup> , organised by 350.org. People worldwide are planning to carry out practical projects to reduce CO <sub>2</sub> , such as by putting solar panels on their school roofs in a grass-roots community led initiative. With support from Councils much more can be achieved.	Offer support to groups and individuals proposing projects. The work will be on-going over decades but the single day is a way of gaining worldwide media coverage and to express the desire for change.	The single day is a way to kick-start a process of change in how we generate power, live, work and travel. One day will not result in massive CO <sub>2</sub> savings but projects started this year and using this single day as a launch-pad might.
Integrating CO <sub>2</sub> reduction & sustainability into the LDF process	6  S.9 pg 26	Pooran Desai and the Bio-Regional organisation have set “One Planet Living” Standards: 10 Principles. These include, Zero carbon, zero waste, sustainable transport/materials/water/food/habitats, social justice and happiness as principles of economic regeneration. <sup>12</sup>	Make CO <sub>2</sub> reduction and One Planet Living Standards a central theme of county strategic documents, including the “Shaping Our Place, Vision to 2026” integration into all sections of the planning process.	Massive savings via good planning. Integrated housing/work/food production etc to minimise transport, laying out street pattern to maximize solar gain, carbon sequestration based agriculture....
Energy: Community Owned Renewables	7  S.7a pg 19	Fintry Development Trust <sup>13</sup> is a community group who own Fintry Wind Turbine <sup>14</sup> , Stirlingshire, Scotland. Community Owned Renewable Energy has multiple benefits & is popular.	Encourage and support community owned renewable energy generation technology including wind turbines, in multiple locations across the County.	As renewables increase old coal power stations will close, with huge CO <sub>2</sub> savings. Community ownership has many benefits as the Fintry project demonstrates.

<sup>11</sup> [http://action.350.org/p/salsa/web/common/public/signup?signup\\_page\\_KEY=4941](http://action.350.org/p/salsa/web/common/public/signup?signup_page_KEY=4941)

<sup>12</sup> <http://www.bioregional.com/our-vision/one-planet-living/>

<sup>13</sup> <http://www.fintrydt.org.uk/>

<sup>14</sup> <http://thescotsman.scotsman.com/scotland/Fintry39s-green-revolution-means-power.3761482.jp>

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Energy	8 S.7a pg 21	Good Energy <sup>15</sup> is an example of an electricity company selling 100% renewably-generated electricity, from small and large producers.	Ensure that all council buildings, hospitals, schools are signed-up to a supplier like this.	A very quick and easy way for the council to reduce the carbon intensity of the power it uses.
Energy, Transport, Agriculture & Waste Reduction	9  S.7a pg 20	LeAD Leominster's proposed Community Owned Anaerobic Digester <sup>16</sup> , for otherwise waste material, will be a UK first, with great potential multiple benefits.	All possible support should be given to LeAD and other community owned renewables projects. There is great scope for County-wide roll out.	Renewable electricity, hot water for a district heat main, biogas, possibly for a local biogas bus, and soil conditioner; CO <sub>2</sub> savings all round. Community Ownership should also create many positive social and economic benefits.
Sewerage, Energy, Transport & Agriculture.	10  S.7a pg 20	Oslo uses heat from the city's sewers to heat 9,000 flats <sup>17</sup> , then puts the sewage through an Anaerobic Digester, using the bio-methane to power 200 <sup>18</sup> buses.	Investigate the use of the heat from the city's sewers and Anaerobic Digester technology to generate hot water for a heat main, bio-fuel for transport or electricity generation.	Somewhat like LeAD but on a much bigger scale. Renewable electricity, hot water, biogas and soil conditioner; CO <sub>2</sub> savings all round.

<sup>15</sup> <http://www.goodenergy.co.uk/>

<sup>16</sup> <http://www.shareenergy.coop/projects/lead/>

<sup>17</sup> See <http://www.planetark.com/dailynewsstory.cfm/newsid/35952/story.htm>

<sup>18</sup> See <http://www.guardian.co.uk/environment/blog/2009/jan/27/biomethane-energy>

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Transport	11  S.8c pg 24	Glúas is a community group in Galway <sup>19</sup> promoting a tram or light rail system for Galway, modelled on Freiburg's trams and transport systems. Trams and light rail are some of the most energy and space efficient forms of transport, especially the new City Class trams under consideration in Galway.	Emphasise walking, cycling and public transport as the best way to ease congestion and lower emissions. Galway is a city only a little bigger than Hereford and a tram system could be the Jewel in the Crown for both cities.	If Galway's model was followed this could be of zero cost to Herefordshire Council, using private and grant funding, and zero carbon traffic solution. Less cars means less congestion, local air pollution and CO <sub>2</sub> emissions, and improved quality of life for all.
Transport	12  S.8d pg 24	Hamburg Hydrogen Fuel-cell buses <sup>20</sup> have been in service for a decade or so. The new Mercedes-Benz Citaro hydrogen fuel-cell /ion lithium battery hybrids are claimed to be 50% more fuel efficient, and due to come into service in 2010.	With a range of 155 miles these may be appropriate for a County wide bus network.	Much reduced CO <sub>2</sub> and particulate emissions, plus reduced noise. Cutting-edge bus transport. But again, maximum benefits only when fuelled with renewably-generated hydrogen, via renewable electricity.
Transport & Safety	13  S.8a pg 23	"20's Plenty" <sup>21</sup> for lower speed limits in residential areas. Portsmouth has led the way on this, but the movement is spreading. This reduces accidents, increases walking and cycling as safe pleasant options.	Join the "20's Plenty" movement and restrict maximum speeds to 20 mph in residential areas.	Slower traffic means safer streets, so more people choosing to walk or cycle, making for a more pleasant environment and lower CO <sub>2</sub> emissions.

<sup>19</sup> <http://www.gluas.ie/>

<sup>20</sup> <http://green.autoblog.com/2009/11/17/daimler-debuts-next-gen-citaro-fuel-cell-bus-in-hamburg-half-th/>

<sup>21</sup> <http://www.20splentyforus.org.uk/>

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Transport	14  S.8e pg 25	Car Share Clubs. Colwall <sup>22</sup> in Herefordshire provides an example of what can be done by community led initiatives.	Help promote such groups, including the County-wide car share programme – <a href="#">Twoshare</a> .	Initially savings of CO <sub>2</sub> would be small, but as the schemes grow and gradually convert their fleets to renewably-generated fuels then the savings become significant. Also savings in terms of air quality/congestion/street parking space.
Transport	15  S.8e pg 25	Efficient, renewably-generated fuel cars. 2 good examples: Riversimple <sup>23</sup> hydrogen fuel-cell, Think <sup>24</sup> ion lithium battery car.	Work with business to provide support, such as electric plug-in points and hydrogen stations.	Initially the savings will be small. Bigger gains will be dependant on increases in renewably-generated electricity.
Existing Buildings	16  S.9b pg 28	Bishops Castle Home Energy Service HES <sup>25</sup> , winners of the Big Green Challenge in Jan 2010. Survey buildings, saving heating bills and CO <sub>2</sub> while building community.	Already operating in Herefordshire to small extent. Huge scope for a County wide roll-out of house energy surveys undertaken by trained volunteers	HES states: over 1,000 households are saving an average of 29% off carbon emissions and £380 off fuel bills per home per year.

<sup>22</sup> <http://www.greener.colwall.info/carclub/index.html>

<sup>23</sup> <http://www.riversimple.com/>

<sup>24</sup> <http://www.thinkev.com/>

<sup>25</sup> <http://www.h-e-s.org/1/home.php>

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Existing Buildings	17  S.9b pg 28	Kirklees Council, Yorkshire, has been showing leadership on CO <sub>2</sub> reduction since 1992. Under various schemes houses have been properly insulated, solar panels fitted <sup>26</sup> .	This ties-in with HES (Proposal 16). Free surveys, free insulation and interest free loans on energy saving technologies for all households in the County, in addition to current <a href="#">housing schemes</a> .	This has the potential to massively reduce CO <sub>2</sub> emissions, heating bills, fuel poverty, create jobs, attract external funding, build community and exhibit Council leadership.
Existing Buildings	18  S.9b pg 28	Berkeley FIRST <sup>27</sup> . In 2007 Berkeley, California, started the “Financing Initiative for Renewable and Solar Technology” Now being taken nationwide in USA, led by Vice President Joe Biden <sup>28</sup>	Ties-in with HES & Kirklees experience, and helps make financing easier. Councils pay for energy saving investments such as insulation or solar panels and recoup the money over 20 year charge on Council Tax	Householders often cite lack of ability to pay the upfront costs as a barrier to making long term energy and CO <sub>2</sub> saving investments. This solves that problem.
New Build	19  S.9a pg 28	BedZED <sup>29</sup> (Beddington Zero Emissions Urban Development project) was developed by Bio-Regional and completed in 2002. It is an example of good energy saving design for a development of 100 houses and flats, plus some workshops and offices.	Encouraging developers to meet these standards and add additional features such as AECB Gold, Combined Heat and Power systems, District Heating incorporating Solar Interseasonal Heat Storage etc: could achieve remarkable results and improve on the original BedZED development.	This kind of integrated urban development offers great scope for CO <sub>2</sub> reductions. On the video clip <sup>30</sup> it is claimed that BedZED residents have 56% lower than average carbon footprints. This could be improved upon with latest materials and learning.

<sup>26</sup> <http://showcase.hcaacademy.co.uk/case-study/kirklees-council-warm-zone.html>

<sup>27</sup> <http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=26580>

<sup>28</sup> [http://articles.sfgate.com/2009-10-20/bay-area/17186510\\_1\\_financing-plan-property](http://articles.sfgate.com/2009-10-20/bay-area/17186510_1_financing-plan-property)

<sup>29</sup> <http://www.bioregional.com/what-we-do/our-work/bedzed/>

<sup>30</sup> <http://www.bioregional.com/what-we-do/our-work/bedzed/>

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Built Environment	20  S.9a pg 28	The Passive House <sup>31</sup> Movement started in Darmstadt, Germany, in 1988 and has now grown in many countries. Association of Environmentally Conscious Builders (AECB) <sup>32</sup> is a UK organisation setting high standards. Its' Gold Standard is the best. These are examples of organisations trying to raise the thermal efficiency of housing, so saving energy and CO <sub>2</sub> .	Make these the standards for all new buildings in the County. Every new building presents a tremendous opportunity to massively raise standards. It is more difficult to retrofit to these standards, but as Andy Simmonds has demonstrated, through his retrofit in Hereford, it is possible.	Massive savings in CO <sub>2</sub> , fuel bills and fuel poverty are achievable. Huge opportunities for training and job creation. Multiple benefits and probably the best return on investment in terms of CO <sub>2</sub> reduction.
Built Environment	21  S.9a pg 27	District Heating has been the norm in Denmark for about 80 years. Friedrichshafen <sup>33</sup> in Germany and Marstal <sup>34</sup> in Denmark, have solar powered district heating with interseasonal heat stores to save the summers heat for winter use. This type of system is now spreading in Germany & Scandinavia.	District heating, often incorporating combined heat and power systems, is much more efficient than each house having to have separate boilers. Plan new housing developments in Herefordshire around such technology.	Combining a district heating system including a solar interseasonal heat store with the highest insulation and thermal efficiency standards (above) would really be an example of global best practice. Huge CO <sub>2</sub> and fuel poverty reductions.
Built Environment	22  S.9a pg 27	Novacem <sup>35</sup> / Calera <sup>36</sup> Cements offer the possibility of carbon sequestration in buildings, and so carbon negative buildings.	Join early trials and commercial roll-out.	Perhaps a few years off, but with great potential to sequester CO <sub>2</sub> in buildings. Replaces concrete which is responsible for high CO <sub>2</sub> emissions.

<sup>31</sup> [http://en.wikipedia.org/wiki/Passive\\_house](http://en.wikipedia.org/wiki/Passive_house)

<sup>32</sup> <http://www.aecb.co.uk/>

<sup>33</sup> <http://www.agores.org/Publications/CityRES/English/Friedrichshafen-DE-english.pdf>

<sup>34</sup> <http://www.energymap.dk/Profiles/Ramboll/Cases/Large-Scale-solar-heating-in-Marstal>

<sup>35</sup> <http://www.novacem.com/>

<sup>36</sup> <http://www.calera.com/>

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Farming, social action, health & education	23  S.10a pg 30	Will Allen, Growing Power, Milwaukee, USA <sup>37</sup> Community Supported Agriculture on a big and transformative scale. Dozens of full time staff and thousands of volunteers and visitors. Wonderful social and economic gains.	Set land aside in Hereford City and in all the County's Market Towns as near as possible to where people live to grow food in ecologically restorative and socially transformative ways.	Multiple Benefits. Local organic food replaces distant supplies thus reducing CO <sub>2</sub> and improving food security and health. Growing Power in Milwaukee has seen falling crime and anti-social behaviour and rising social inclusion and educational achievement as a direct result of their work.
Farming & Soil Based Carbon Sequestration.	24  S.10b pg 30	Joel Salatin Polyface Farm <sup>38</sup> Pasture-fed multi-species livestock farming sequesters carbon, adds to soil fertility, while training apprentices and creating green jobs. By selling directly to the public farm profitability is good allowing further investment in good practice. Graham Harvey's book "The Carbon Fields" popularised this technique.	Encourage and assist farmers wanting to change Herefordshire Farmers are in many cases in difficult times, tied into farming in ways that are ecologically, economically and socially unsustainable. Joel Salatin offers an alternative vision of livestock farming.	Carbon Sequestration through photosynthesis and long term storage in soils will be a big future industry while also hugely improving fertility. Livestock farmers have a key role to play. Agricultural grants may in future be dependent upon CO <sub>2</sub> sequestration.
Food, Farming & Education.	25  S.10b pg 31	Soil Association "Food for Life" <sup>39</sup> programme is getting schools to sign-up to use 75% non-processed food, 50% local food and 30% organic. Improves diet, local economy, food education while lowering carbon emissions.	Encourage all schools in the County to sign-up to this, and then extend it to other sectors such as hospital and council caterers. Orleton school is already leading the way in the County.	By lowering food miles, processing and packaging, and by converting to organics there will be small but cumulative CO <sub>2</sub> savings, as well as diet, health and economic benefits.

<sup>37</sup> <http://www.growingpower.org/>

<sup>38</sup> <http://www.polyfacefarms.com/default.aspx>

<sup>39</sup> [http://www.sd-commission.org.uk/communitiessummit/show\\_case\\_study.php/00132.html](http://www.sd-commission.org.uk/communitiessummit/show_case_study.php/00132.html)

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Soil based carbon sequestration/ Business	26  S.10b pg 31	Biochar. Ancient system for improving soils which also sequesters carbon. The international Biochar Institute, <sup>40</sup> University of New South Wales, Australia, <sup>41</sup> and many others are developing this carbon sequestration and soil fertility technology.	Herefordshire is an agricultural landscape with many woodlands, which coupled with the best pyrolysis technology, research and development and investment has the potential to start new businesses, create green jobs and sequester carbon.	Another form of photosynthesis based carbon sequestration. Probably a huge potential, but needs R&D; an industry in early stages of development which Herefordshire based businesses might well get in on the early action.
Business & Industry	27  S.11 pg 31	Rocky Mountain Institute <sup>42</sup> Founded in 1982 by Amory & Hunter Lovins with the goal of creating an efficiency revolution in how humanity uses energy. Much ground breaking work since with many industries and partner organisations	Investigate how we can join the energy efficiency revolution, in transport, buildings, energy generation and in the commercial sector. Attracting leading edge businesses will open up many new economic opportunities and save carbon.	Efficiency gains are in many circumstances the best way to cut carbon in a cost effective way. The Rocky Mountain Institute shows what can be done.

<sup>40</sup> <http://www.biochar-international.org/>

<sup>41</sup> <http://www.science.unsw.edu.au/news/unsw-leading-on-biochar-research/>

<sup>42</sup> <http://www.rmi.org/rmi/About+RMI>

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Business & Industry	28  S.11 pg 32	Yu Qun mayor of Baoding in China has shown tremendous leadership in making his city a renewable energy hub <sup>43</sup> . It is now often cited as the world's first carbon negative city. Simultaneously it has seen great economic growth.	Follow Yu Qun's lead and attract renewable energy equipment companies. Renewable energy equipment manufacture is one of the fastest growing industries in the world.	CO <sub>2</sub> reduction requires this shift to renewables and efficiency. If managed well there exist multiple benefits.
Education & Inspiration	29  S.10a pg 30	In 1977 Ibrahim Abouleish established Sekem <sup>44</sup> , a farm in the Egyptian Desert. The farm has diversified, starting numerous businesses, educational projects and satellite farms. This year Sekem launches Heliopolis University <sup>45</sup> specializing in Organic Agriculture, Sustainable Engineering, Economics and Pharmacy.	Could an organic, ecologically restorative farming initiative with big social and economic aspirations like Sekem or Growing Power in Milwaukee provide a model for a new form of higher education provision in Herefordshire?	Initially little direct CO <sub>2</sub> savings but with vast potential in the longer term if the project developed to its true potential.
Community Creativity	30	We all have a part to play and I would like each person reading this to think of one inspirational example of something that reduces CO <sub>2</sub> while having multiple other benefits.	Through New Leaf <sup>46</sup> these ideas could be fed into an ongoing research and action process for Herefordshire stakeholders to engage with.	Who knows what might be achieved with many minds working on a common problem! The Internet and Wikipedia are good examples.

<sup>43</sup> <http://www.csmonitor.com/Innovation/Energy/2009/0810/how-baoding-china-becomes-world-s-first-carbon-positive-city> (journalistic error: the term 'carbon positive' should read 'carbon negative'.)

<sup>44</sup> <http://www.sekem.com/english/default.aspx>

<sup>45</sup> <http://www.sekem.com/english/cultural/University.aspx>

<sup>46</sup> <http://www.herefordshirenewleaf.org.uk/>

# Possible Carbon Reductions in Herefordshire; Learning from Global Best Practice.

## 1. Introduction

The Maldives has plans in place to go carbon neutral within a decade<sup>47</sup>, and Norway plans to do so by 2030<sup>48</sup>. With atmospheric CO<sub>2</sub> at 388 parts per million (ppm) and rising fast, there is a growing scientific consensus that reducing this figure to 350 ppm or lower is the safest option. Allowing levels to continue to rise takes humanity into very grave danger<sup>49 50</sup>. One example: In an ice free world High Town in central Hereford would be 25 m under the sea<sup>51</sup>. Therefore global best practice is 100% reductions, as fast as possible, and with additional carbon sequestration.

The UK Government has signed up to an 80% reduction by 2050<sup>52</sup>. This is not as radical a cut as science suggests is

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<sup>47</sup> <http://www.guardian.co.uk/environment/2009/mar/15/maldives-president-nasheed-carbon-neutral>

<sup>48</sup> <http://www.treehugger.com/files/2009/10/norway-pledges-carbon-neutral-2030.php>

<sup>49</sup> "Planet Earth We Have a Problem: Feedback Dynamics and the Acceleration of Climate Change. by Peter Cox, Deepak Rughani, Peter Wadhams & David Wasdell. Published by the All Party Climate Change Group, 2007

<sup>50</sup> "Six Degrees" by Mark Lynas Published by Harper Perennial, 2008 edition.

<sup>51</sup> US Dept. Of Geology. An ice free world =80m global sea level rise. Their website.

<sup>52</sup> [http://www.opsi.gov.uk/acts/acts2008/ukpga\\_20080027\\_en\\_2#pt1-pb1-l1g1](http://www.opsi.gov.uk/acts/acts2008/ukpga_20080027_en_2#pt1-pb1-l1g1)

necessary, but it will nevertheless be extremely challenging to achieve.

Herefordshire has signed up to NI 186 in the county Local Area Agreement, and set itself a 13.1% carbon reduction target over a three year period. As with many data collections, not all that ought to be measured can be measured. In Herefordshire's case, for example, the embodied energy in manufactured goods, and the CO<sub>2</sub> and other gases released by farming practices are not included. However, it remains an ambitious target and a good first step. Sadly, on current projections, the feeling is that the county is unlikely to achieve this target, one of the reasons for commissioning this report. Current UK CO<sub>2</sub> reductions appear mainly to originate from outsourcing manufacturing to China and the economic effects of the recession<sup>53</sup>.

## 2. An interlinked network of problems

Climate change is perhaps the greatest threat humanity has ever faced. However, it is not the only problem facing humanity. There are many macro-level problems such as ocean acidification, loss of biodiversity, desertification, hunger and poverty that are all interconnected, each amplifying the others. The social and economic issues are deeply connected to the

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<sup>53</sup> Dieter Helm Professor of the Politics & Economics of Climate Change, Oxford University. Numerous articles.

environmental ones. This is also the case at a local level. For example, a child's obesity is often in part at least caused by lack of exercise, the result of being ferried around in a car rather than walking. This contributes to climate change and may lead to a decline in the child's self esteem, with possible mental health and school achievement knock-on effects.

### **3. An interlinked network of solutions**

The most effective and beneficial solutions to climate change will be the ideas, technologies, projects and developments that simultaneously solve multiple problems. In this report, I will write about a number of such examples gleaned from global best practice that might be used as inspirations that we in Herefordshire can learn from as we plan our own low carbon future. There are often synergistic benefits from doing several new things together, demonstrating a network of interlinked solutions.

### **4. Projects as multi-level solutions**

Many of the best projects that result in substantial CO<sub>2</sub> reductions were not necessarily set-up with CO<sub>2</sub> reduction as the major objective. Rather, other social and economic goals were of primary importance with CO<sub>2</sub> reduction as a secondary level goal. For example, the Growing Power project in

Milwaukee<sup>54</sup> had as its original aim, a farmer wanting to grow and sell organic food in inner city Milwaukee, and a community group looking for meaningful activity for disaffected teenagers. As the two aspects came together a food production and diet revolution took place, educational attainment rose, crime and anti-social behaviour fell, and so too did CO<sub>2</sub> emissions.

### **5. Projects as process**

Individual projects must not be seen in isolation, but rather as part of an on-going evolutionary process. For example, the carbon footprint of an inhabitant of Vienna will on average be very much lower than an inhabitant of Houston, Texas, due to the differences in history, town planning and especially of transport infrastructure. To achieve the stated CO<sub>2</sub> reduction goals to which the UK government is already signed-up, will require setting new policy objectives and making technological choices in business, industry, agriculture, transport, housing, and most of all in the planning process.

### **6. Planning an integrated low-carbon vision for Herefordshire**

Reducing CO<sub>2</sub> emissions is best done hand-in-hand with the planning process. Herefordshire Councils' 'Shaping Our Place' document puts forward a vision for the County up until 2026. It is not yet clear that this document will deliver the carbon

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<sup>54</sup> <http://www.growingpower.org/>

reductions required to meet our national targets. It is my hope that the ideas in this document are considered along with the wider process of consultation, and that subsequent drafts will feature CO<sub>2</sub> reductions more strongly.

## 7. Energy

By 2026 it is probable that global oil production will have passed its peak. As supply falls, if demand remains high and even increasing, then extreme price rises become inevitable, with profound social and economic repercussions. Climate change is a driving force for carbon taxes, which might help even-out extreme price volatility caused by Peak Oil, though only by making the price increase smoother, not smaller. Countries, counties and companies that can best plan their transition to reduced fossil-fuel dependence will be at a distinct economic advantage. We see this now with industries such as wind and solar equipment manufacture, for example Chinese wind capacity saw year-on-year growth of 107% last year, whilst car manufacturing is declining in the USA and Europe.

An increasing number of writers are pointing to the multiple benefits of moving from a fossil fuel based economy to one based 100% on renewable sources of energy<sup>55 56</sup>. Certainly there

are many examples of economies that have booming renewable electricity equipment sectors providing many well paid jobs and export earnings, along with a wide variety of other benefits, while allowing the substantial and long term CO<sub>2</sub> reduction. Germany, Denmark and Spain are obvious European examples. Perhaps the most remarkable example is the city of Baoding in China, labelled by some, as the first carbon neutral city in the world, as it has completely transformed its industrial base to make a wide variety of renewable energy technologies, led by the inspirational mayor Yu Qun<sup>57</sup> (Proposal 28).

Much of the UK electricity generation industry is at the end of its useful life. Magnox reactors and old coal plants are to be shut. UK governments have traditionally looked to coal, gas and nuclear. However, the advantages of an electricity generation mix dominated by renewables are becoming clearer, as their costs are on a falling trend in comparison with the rising cost associated with both nuclear and fossil-fuel generation. Renewables are the fastest growing sector of the global electricity industry. Achieving dramatic falls in CO<sub>2</sub> emissions will be very much easier as renewables come to dominate the electricity sector. In 2007, WWF published a list of the 30 most

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<sup>55</sup> Mark Jacobson & Mark Delucchi, Scientific American, Nov 2009

<sup>56</sup> "Our Choice" by Al Gore, Rodale Press, 2009. See also his "Repowering America", a web based campaign calling for the USA to make the 100% switch in a decade.

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<sup>57</sup> <http://www.csmonitor.com/Innovation/Energy/2009/0810/how-baoding-china-becomes-world-s-first-carbon-positive-city> (journalistic error: the term 'carbon positive' should read 'carbon negative'.)

polluting coal-fired power stations in Europe, the so-called Dirty 30. Our local one is Ratcliffe on Soar<sup>58</sup> in Nottinghamshire, which ought to be wound down as rapidly as possible.

A high voltage direct current (HVDC) super-grid is planned to connect off-shore wind farms from Ireland to Lithuania<sup>59</sup>, bringing in Icelandic geothermal, Norwegian hydro and Saharan solar<sup>60</sup>. These should be the main power sources for the whole of Europe by 2030. Many other sources will add to the mix including Ocean Thermal Energy Conversion<sup>61</sup> (OTEC) which could be carried out on artificial floating islands in the tropics. Wave and tidal power will be significant for the UK and many other countries, with the wonderful European Marine Energy Centre (EMEC) in Orkney leading the way<sup>62</sup>. Energy storage will be important to even out any fluctuations caused by having a large amount of wind generated power. Pumped hydro, such as Dinorwig<sup>63</sup>, will become much more common, with many novel methods such as green energy islands, envisaged by Gottlieb Paludan<sup>64</sup>. The renewable production of transport fuels such as

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<sup>58</sup> <http://www.reuters.com/article/idUSLM253369>

<sup>59</sup> <http://www.reinforcedplastics.com/view/5777/uk-signs-up-to-european-offshore-wind-grid/>

<sup>60</sup> <http://www.desertec.org/en/concept/>

<sup>61</sup> <http://www.gizmag.com/energy-island-otec/8714/>

<sup>62</sup> <http://www.emec.org.uk/>

<sup>63</sup> <http://www.fhc.co.uk/dinorwig.htm>

<sup>64</sup> <http://www.energymap.dk/Profiles/Gottlieb-Paludan-Architects/Projects/Green-Power-Island--Florida>

hydrogen and ammonia<sup>65</sup>, and battery powered vehicles will help even out potential grid fluctuations. This, coupled with a massive energy efficiency programme and the widespread use of smaller scale local renewable energy generation, represents best practice in terms of carbon reduction, ecological sustainability and the best path to future prosperity.

Two examples of what can be achieved are found in Samsø and Spain (Proposals 1 & 2). The island of Samsø, Denmark, in 1997 set itself the visionary goal of transforming its economy to be powered by 100% renewable energy in a decade. By 2007 it had met this challenge, achieved by a number of means, gaining global recognition. By insulating houses and connecting more of them to efficient wood and straw fuelled district heating schemes, power needs were reduced, and by building both offshore and onshore wind farms, zero carbon energy could be used to replace old coal fuelled electricity generation. Some people in Samsø hoped for things that didn't happen, such as the replacement of the petrol cars by electric ones. However, this change over will probably take place in the future. Overall, Samsø provides an inspirational example.

The Spanish electricity generation industry is a much bigger and more mixed picture. However, demand for electricity in Spain fell 4.3% last year sadly due to the recession rather than

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<sup>65</sup> <http://www.ammoniafuelnetwork.org/>

increased efficiency. There has been one major and inspirational achievement, and that is the speed at which its renewable electricity industry has grown over the last 5 years. Spain is a world leader with regards to several forms of solar power and the rise in percentage of renewable electricity as a proportion of energy generation. Concentrating solar power, where steam is used to drive turbines to generate electricity, photovoltaic panels, and the newer concentrating photovoltaics all have a positive role to play, as does wind, geothermal and biomass.

A proper examination of large scale, multi-gigawatt renewable energy projects, is outside the scope of this report but will be examined in another document by this author. The role of energy efficiency is crucial, and often represents the best return on investments. This will be examined in the latter sections of this report, mainly housing and transport. Smaller scale, dispersed renewable energy generation is the third leg of this three legged stool. Its role is examined below.

### **7a. Local renewable energy**

Community ownership of renewable energy projects has many advantages. Opposition to wind turbines often occurs where local people feel that they haven't been consulted. The village of Fintry in Stirlingshire, Scotland, is a fine example of what can

be done<sup>66</sup> (Proposal 7). When a wind farm was proposed, the locals asked to buy one of the 2.5 Mw turbines<sup>67</sup> and now receive income from electricity sales of £67,000 p.a. which, once the bank loan is paid off, is expected to rise to £400,000 p.a. All of the income is currently invested in carbon and energy reduction efforts, such as super-insulating the entire local housing stock and planning to start a renewably-generated, hydrogen powered bus service.

Another example of the multiple benefits of community owned renewables is the Green Valleys project in the Brecon Beacons National Park<sup>68</sup>. The climate and topography here allows the potential of micro-hydro to be developed, producing CO<sub>2</sub> free electricity, aiding community cohesion through shared project development, further carbon sequestration through better peat management, and improved flood prevention through increasing the sponge effect of the uplands. The Green Valleys project has recently been awarded £300,000 as one of the winners of the NESTA Big Green Challenge. Innovative projects such as these are very good for the image of a community, as worldwide media interest puts otherwise out-of-the-way places centre stage. Several project proposals in this document have the

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<sup>66</sup> <http://www.fintrydt.org.uk/>

<sup>67</sup> <http://thescotsman.scotsman.com/scotland/Fintry39s-green-revolution-means-power.3761482.jp>

<sup>68</sup> <http://www.thegreenvalleys.org/>

possibility to vastly enhance the reputation of Herefordshire, as Fintry's wind turbine has done for Fintry village and the Green Valleys project has done for the Brecon Beacons.

Energy4all, a not-for-profit company funded by Advantage West Midlands, is helping a number of local community-owned renewable energy projects (including wind, hydro and biomass) become established. One project, which has the potential to "put Herefordshire on the map" and that Energy4all are supporting, is LeAD<sup>69</sup>. The project is to establish a community-owned anaerobic digester in Leominster, the first such in the UK (Proposal 9). This would have multiple benefits; producing CO<sub>2</sub>-free renewable electricity, hot water for district heating, biogas (possibly to fuel a bus), and a distillate which will be used as a soil conditioner and fertilizer. At a public meeting in Leominster on 28/01/10 much support was expressed. Such projects can be ecologically and economically beneficial and popular. There exists considerable scope for the County-wide roll-out of dozens of similar projects.

In Hereford we might well learn from Oslo, where heat pumps have been fitted to the city sewers, extracting sufficient heat for 9,000 flats<sup>70</sup> (Proposal 10). The sewage then becomes part of the feedstock for an anaerobic digester that produces bio-

methane which fuels a fleet of 200<sup>71</sup> buses and again the distillate is used on local farms. Changing sewage from a waste product into a useful resource has proved economically and ecologically beneficial, and resulted in a large reduction in carbon emissions.

Rotherwas sewage works might be converted to similar advantage. Anaerobic digesters could be built on many farms, in villages and on the edge of our market towns. Ground source heat pumps could usefully be incorporated into many new building developments, and into Hereford's sewers. Micro-hydro could be a small but significant source of power for certain well favoured locations.

Wind power has considerable potential for Herefordshire. If the Reeves Hill wind farm had been handled differently and the community ownership was made a more important aspect from the beginning, then far greater public support might have been generated and opposition minimized. The UK could learn much from continental Europe, where the economic benefits of wind power generally get well distributed in the local community. In the UK the profits go mainly to the power companies and the individual land owner: no wonder there is greater public acceptance of wind power in Europe.

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<sup>69</sup> <http://www.shareenergy.coop/projects/lead/>

<sup>70</sup> See <http://www.planetark.com/dailynewsstory.cfm/newsid/35952/story.htm>

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<sup>71</sup> See <http://www.guardian.co.uk/environment/blog/2009/jan/27/biomethane-energy>

If Herefordshire Council made clear that planning permission for future wind farms would be more likely to be granted if the whole project was designed to maximise community benefit this could overcome much of the current opposition. If we in Herefordshire could establish a fund that benefitted from the sale of renewably-generated electricity and invested in eco-retrofitting all the local housing stock, then the potential CO<sub>2</sub> savings would be huge, as would the monetary savings for the local people as a result of much lower energy bills, and therefore dramatic reduction in fuel poverty.

Solar power will be a part of Herefordshire's energy mix. Saharan solar may be a small input, but solar also has many local applications. Passive solar design<sup>72</sup> in architecture will reduce heating bills, solar water heating will be widespread (ideally incorporating interseasonal heat storage<sup>73</sup> as part of district heating schemes<sup>74</sup>), and solar photovoltaics will be used on rooftops wherever possible. As the price of photovoltaic cells is falling fast, the role of this technology becomes ever more important, especially now the UK is starting a very generous feed-in tariff from 01/04/10. Farmers may incorporate photovoltaic arrays into fields and onto farm buildings, perhaps with dual access solar tracking, as Anne Adams has done at

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<sup>72</sup> <http://passivesolar.sustainablesources.com/>

<sup>73</sup> <http://www.agores.org/Publications/CityRES/English/Friedrichshafen-DE-english.pdf>

<sup>74</sup> <http://www.energymap.dk/Profiles/Ramboll/Cases/Large-Scale-solar-heating-in-Marstal>

Luston. Many of these solar technologies would of course be individually owned, being part of peoples' houses, but there exists the potential for a village to do a community owned larger photovoltaic array.

A quick and effective way for Herefordshire Council to reduce its' carbon footprint is to ensure that all Council buildings, schools and hospitals are signed-up to an energy supplier such as Good Energy<sup>75</sup> who sell only renewably-generated electricity (Proposal 8).

## **8. Transport**

Herefordshire is at a transport crossroads. Some people are arguing for by-passes for Hereford, Bromyard and a second Leominster by-pass seeing these as the best options for easing traffic congestion. However there is ample evidence that road building encourages more cars onto the roads and, coupled with the plans to expand Hereford, congestion could easily get worse with more road building. There are contrasting models to follow. Houston, Texas, is a city devoted to the car. Roads are built without pavements and pedestrians are non-existent. CO<sub>2</sub> emissions are huge and the city generally regarded as unpleasant. Vienna and Amsterdam are a couple of cities where public transport, cycling and walking provision is excellent,

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<sup>75</sup> <http://www.goodenergy.co.uk/>

resulting in both much lower CO<sub>2</sub> emissions and a more liveable, enjoyable city. It should therefore be a priority for Hereford City and County Councils to get more people walking, cycling and using public transport.

### **8a. Walking and cycling**

“Walker-friendly places are people-friendly places. Putting walkers’ needs first results in a more attractive, ‘livable’ environment for everyone, where people not only walk but also linger, meet, interact and play. More people out and about on foot, makes everyone feel safer and discourages crime and anti-social behaviour”<sup>76</sup>, and also lowers CO<sub>2</sub> emissions.

In Hereford we already have some areas of the city with very good walking and cycling provision. The route into the city centre from Putson via the Bishops Meadow, Victoria Footbridge and Castle Green represents a very popular, pleasant, quick and efficient low carbon transport option. From Hunderton, the Great Western Way cycle and walking route along the old railway is very good. However, many areas of the city have very poor provision. Whitecross, Tupsley and Aylestone Hill are examples of areas where it’s very difficult to find safe and pleasant walking and cycling routes into the city centre. Consequently people from these areas more often use

cars, adding to congestion, local air pollution, CO<sub>2</sub> emissions, accidents, all including a financial cost to themselves. With better walking and cycling provision they may not use the car to the mutual benefit of all concerned.

One option to improve walking and cycling provision is to build dedicated routes and the proposed Sustrans walking and cycling bridge linking Bartonsham to the Rotherwas Industrial Estate is an excellent example of what can be done<sup>77</sup>. Incidentally it should be noted that while there is much talk of a second river crossing, Hereford already has six river crossings, and making better use of these existing bridges will prove much cheaper and more effective than building another road bridge. If I had to cite one piece of transport infrastructure that Hereford should feel proud of it is the Victoria Footbridge.

However, in many areas of town constructing new routes would require compulsory purchase of land and demolishing houses. A much cheaper, and in many respects better option, is to make all roads safer by lowering speed limits. There is a national campaign called “20’s Plenty” to make 20 mph the normal speed limit for residential areas. This generally helps steady traffic movement, promotes road safety, encourages greater use of bicycles and lowers CO<sub>2</sub> emissions<sup>78</sup>. Portsmouth City

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<sup>76</sup> Transport 2000 Trust/DfT 2003

<sup>77</sup> [http://www.sustransconnect2.org.uk/schemes/project\\_detail.php?id=92](http://www.sustransconnect2.org.uk/schemes/project_detail.php?id=92)

<sup>78</sup> <http://www.20splentyforus.org.uk/>

Council has provided leadership on this issue<sup>79</sup>. Many UK cities are now following suit. Hereford should join them (Proposal 13). This would be a very cheap way to achieve road safety and CO<sub>2</sub> reduction goals. Further benefits could be created by adding in “shared space” road use ideas first developed in Holland by Hans Monderman<sup>80</sup>.

Taxing supermarket car parks would act as a further disincentive to bringing the car into Hereford, and the funds raised could be used to develop better walking, cycling and public transport provision. This would also have the added benefit of helping small locally owned businesses who currently are at such a massive disadvantage in comparison to the supermarkets. Other disincentives may include congestion charging, pedestrian zones around schools and workplace car parking charges.

## **8b. Public Transport**

Many cities and towns throughout the world are now investing in improved public transport, and the best examples are of very low or even zero carbon systems. Herefordshire’s public transport infrastructure appears to have suffered decades of under investment and neglect.

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<sup>79</sup> <http://www.portsmouth.gov.uk/living/8403.html>

<sup>80</sup> See Paige Mitchell in Hereford Civic Society Newsletter, November 2009.

## **8c. Trams and Light Rail**

Trains and trams travelling on iron rails have an efficiency advantage over cars and buses by the simple fact of iron on iron friction being less than rubber on tarmac. Also, being longer, and therefore having a lower air displacement to passenger ratio, further enhances their efficiency<sup>81</sup>.

Croydon Tramlink<sup>82</sup> provides an example of what can be done. It is claimed that this system saves 4 million car journeys a year<sup>83</sup>. This has the obvious multiple benefits of easing congestion, improving local air quality and also substantially helping reduce CO<sub>2</sub> emissions. Many smaller cities are now building tram systems.

Galway in Ireland, a city only a little bigger than Hereford, is now planning a new light rail system<sup>84</sup>. One of the case studies they are using is Freiburg im Breisgau in Germany where Combino Trams are used. The sponsors of the Galway system are considering the excellent City Class trams and are also considering the possibility of using local dedicated renewably-generated electricity to power the system. It is suggested that the city authorities will not need to contribute financially. This is

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<sup>81</sup> David MacKay, Sustainable Energy without the hot air. UIT Cambridge, 2009 pp 118-139

<sup>82</sup> <http://en.wikipedia.org/wiki/Tramlink>

<sup>83</sup> <http://www.croydon-tramlink.co.uk/>

<sup>84</sup> <http://www.gluas.ie/>

a very exciting, cost free, excellent, zero carbon transport system, which is perhaps replicable in Hereford (Proposal 11).

There are many possible routes that could be used in Hereford. Jesse Norman has proposed using the existing railway line between Moreton on Lugg and Pontrilas. Frequent light trains or trams could take people into the city stopping at a number of new stops along the route which might include, from south to north: Pontrilas, Kilpeck, Tram Inn, Haywood, Newton Farm/Grafton, Red Hill, Lower Bullingham, Rotherwas, Bartonsham, the Hospital, a new transport hub at the existing Station, Burcott Road, Holmer Trading Estate, Roman Road, Shelwick Green and Moreton on Lugg. Adequate car parking at Pontrilas and Moreton on Lugg would act as a park and ride into Hereford. New housing development could be focused along the line of this route. It might be possible to make the Great Western Way into a shared walking, cycling and slow / light tram route right from Newton Farm to Holmer. Other routes are conceivable, perhaps from Credenhill or Breinton in the west to Bartestree in the east.

#### **8d. Buses**

Buses are gradually changing from diesel to less polluting fuels such as electric batteries, hydrogen, bio-methane, and possibly soon ammonia. Although renewably-generated ammonia has

distinct advantages over hydrogen, and has been used to fuel buses in the past, there are currently no fleets running on ammonia. It is thought that in the future however, buses will run again on ammonia. The two inspirational examples I'll use on this issue are Oslo's bio-methane bus fleet and Hamburg's hydrogen buses.

Oslo makes very good use of its sewage. Sewage, plus food waste and other organic matter are fed into anaerobic digesters to produce bio-methane, fuelling the cities fleet of 200 buses<sup>85</sup>. The Leominster Anaerobic Digester (LeAD) may well produce some gas to fuel a local bus service. A larger system, perhaps incorporating Hereford city's sewage, may fuel our city bus services in the future (Proposal 10).

Hamburg has for a decade or so had hydrogen powered buses, but this year is taking delivery of 10 new Mercedes-Benz Citaro hydrogen fuel-cell/ ion lithium battery hybrid buses, which are claimed to be 50% more fuel efficient than their predecessors. They have a range of 155 miles and therefore may be suitable for County bus routes<sup>86</sup> (Proposal 12).

There are many options for using electric, bio-methane, ammonia or hydrogen powered buses, trams or trains (or any

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<sup>85</sup> <http://www.guardian.co.uk/environment/blog/2009/jan/27/biomethane-energy>

<sup>86</sup> <http://green.autoblog.com/2009/11/17/daimler-debuts-next-gen-citaro-fuel-cell-bus-in-hamburg-half-th/>

combination of these) on numerous routes in Hereford city and Herefordshire. There are many possibilities to lower emissions, improve air quality, ease congestion and greatly enhance the reputation and liveability of the City. The rest of the County could greatly benefit from improved public transport, with similar multiple benefits.

### **8e. Roads and the future of the car**

Nobody can predict the future of the car with certainty. However, it is very likely that petrol will be very much more expensive in the post Peak Oil world. When exactly we reach say £5 or £10 a litre is hard to predict, but it is likely to be much sooner than most people think, accustomed as they are to cheap fuel. There are many ways renewably-generated power can be used as automotive fuel. Electric batteries, hydrogen, ammonia, biogas, methane and compressed air, are some of the more likely fuel energy storage media. Most informed opinion is that these fuels, at least in the initial decade or so, will be more expensive than we've traditionally been used to paying. There is also much interest in many people moving away from individual ownership of cars to becoming members of car clubs. This would lower the cost to the individual and also free road space previously taken-up by many under-used cars. Car clubs are

rapidly gaining ground across Europe and North America<sup>87</sup>. In Herefordshire, Colwall has set the trend<sup>88</sup> (Proposal 14). For rural areas, a majority in Herefordshire, traditional public transport systems are difficult and expensive to organise. As fuel prices rise, rural populations could become increasingly isolated. Both lift sharing and car sharing may also help.

It is recommended that Herefordshire Council tries to assist communities across the County who may want to start car share clubs, perhaps modelled on Colwall, but with the intention to gradually convert to zero carbon vehicles. Examples of these are the ion lithium battery powered Think<sup>89</sup> and the hydrogen fuel cell powered Riversimple<sup>90</sup> car designed in Herefordshire by Hugo Spowers (Proposal 15). To achieve zero emissions, the electricity for the batteries or the creation of pure hydrogen, would need to come from renewable energy sources.

It should be noted that however low the emissions of any car there are still arguments in favour of getting as many people out of their cars possible. Walking, cycling and public transport are the only way to solve traffic congestion. Making streets safer for pedestrians and cyclists is therefore an overarching priority. With slower traffic in residential areas more people will feel safe

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<sup>87</sup> <http://www.etcproceedings.org/paper/support-for-car-share-clubs-a-worldwide-review>

<sup>88</sup> <http://www.greener.colwall.info/carclub/index.html>

<sup>89</sup> <http://www.thinkev.com/>

<sup>90</sup> <http://www.riversimple.com/>

walking and cycling, and the urban habitat will improve. Herefordshire should join other cities such as Portsmouth in the “20’s Plenty”<sup>91</sup> initiative.

#### **8f. Transport summary**

Improved provision for pedestrians and cyclists, including new walking and cycling routes, slower speeds for cars, and much better public transport over the whole county, particularly in Hereford City, coupled with disincentives to bringing cars into the city, promotion of car and lift sharing and the conversion to non fossil-fuels, will facilitate much lower CO<sub>2</sub> emissions. They also provide the other benefits of less congestion, less local level air pollution, fewer accidents and a safer and more pleasant City and County.

#### **9. Housing & planning**

First, one would question the need to build 18,000 new homes in the county. If we are at the end of the fossil-fuel era and moving into the era of renewables, then perhaps we might envisage population shifts on a similar scale as we saw at the beginning of the Industrial Revolution where millions of people moved to the new coalfield based towns. The UKs’ greatest concentration of renewable energy is in the north of Scotland, and it may become an epicentre for new renewable based

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<sup>91</sup> <http://www.20splentyforus.org.uk/>

economic activity and consequent population growth. However, such major demographic trends are outside the scope of this report, so I will accept the premise of 18,000 new houses, although my estimation of the required number would be somewhat lower. Either way the same planning principles apply.

We should plan the future of Hereford and Herefordshire along ecologically sustainable lines. Many people are trying to do the same and are offering a diverse range of models that we can learn from. Many local governments across Europe are signing-up to the Aalborg Commitments<sup>92</sup>, which provide a framework and goals for sustainability, and an achievement tracking methodology (Proposal 3). Hampshire reports this to be a helpful route<sup>93</sup>. Meanwhile communities across the UK, and now spreading into the wider world, are using the Transition Towns model for plotting “Energy Descent Action Plans” (Proposal 4). Totnes<sup>94</sup> and Forest Row<sup>95</sup> have produced interesting documents in a good example of citizen engagement. “One Planet Living Principles” as set out by Pooran Desai and Bio-Regional<sup>96</sup> is another very useful concept (Proposal 6). This approach sets sustainability guidelines for development covering all aspects of building, transport, waste,

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<sup>92</sup> <http://www.aalborgplus10.dk/>

<sup>93</sup> <http://www.hants.gov.uk/decisions/decisions-docs/060724-cabine-R0717103452.html>

<sup>94</sup> <http://totnes.transitionnetwork.org/EDAPwebversion>

<sup>95</sup> <http://transitionforestrow.ning.com/notes/EDAP>

<sup>96</sup> <http://www.bioregional.com/our-vision/one-planet-living/>

habitat and even the pursuit of happiness. If Herefordshire Council signed-up to the Aalborg Commitments, and worked with communities to develop Energy Descent Action Plans, everybody could work together to achieve the “One Planet Living” goals that might just put Herefordshire on the global best practice map! We could all make a start by signing up to the International Day of Action on 10/10/10, organised by 350.org, whereby communities throughout the world will be taking practical action to reduce carbon emissions<sup>97</sup> (Proposal 5).

### 9a. New Build

There is tremendous opportunity to minimize future energy use, save CO<sub>2</sub> emissions, and solve a multitude of other problems through good house planning, design and building. The most important thing is to incorporate sustainability into the layout of new developments. Streets should be laid-out for maximum solar gain, where as many houses as possible have large roof areas facing due south. Solar water heating systems could then cover all this available roof space and feed hot water into an Interseasonal Heat Store as in Marstal<sup>98</sup>, Friedrichshafen<sup>99</sup> and elsewhere. This would provide a good part of the annual heating

<sup>97</sup> [http://action.350.org/p/salsa/web/common/public/signup?signup\\_page\\_KEY=4941](http://action.350.org/p/salsa/web/common/public/signup?signup_page_KEY=4941)

<sup>98</sup> <http://www.energymap.dk/Profiles/Ramboll/Cases/Large-Scale-solar-heating-in-Marstal>

<sup>99</sup> <http://www.agores.org/Publications/CityRES/English/Friedrichshafen-DE-english.pdf>

requirement of a new development of 500 to 1000 houses all on a District Heating scheme, with one central combined heat and power boiler, perhaps fuelled with locally sourced wood chips. This type of system means there is no need for each house to have a separate boiler, bringing with it a considerable cost saving. District Heating Schemes have been long established over much of Europe, with Denmark leading the way, whereas in the UK they are currently virtually unknown (Proposal 21).

We should build to higher standards than the current building regulations demand. Carbon neutrality will be included in UK building regulations from 2016<sup>100</sup>. If we can achieve carbon neutral housing ahead of other areas it will and give local builders a competitive edge in new contracts while developing new skills and reduce CO<sub>2</sub> emissions.

BedZED<sup>101</sup> was developed by Bio-Regional and completed in 2002. It is an example of good energy saving design for a development of 100 houses and flats, plus some workshops and offices. By adding additional features drawn from AECB Gold<sup>102</sup>, and Passive House<sup>103</sup> design and construction methods, Combined Heat and Power systems, District Heating

<sup>100</sup> <http://www.communities.gov.uk/planningandbuilding/theenvironment/taskforce/commitmentsignatories/>

<sup>101</sup> <http://www.bioregional.com/what-we-do/our-work/bedzed/>

<sup>102</sup> <http://www.aecb.co.uk/>

<sup>103</sup> [http://en.wikipedia.org/wiki/Passive\\_house](http://en.wikipedia.org/wiki/Passive_house)

incorporating Solar Interseasonal Heat Storage, and use new materials like the new carbon negative cements soon to come onto the market such as Novacem<sup>104</sup> and Calera<sup>105</sup>, we could achieve remarkable results and improve on the original BedZED development (Proposals 19-22). The scope to build better houses, save CO<sub>2</sub> emissions and improve peoples' quality of life is huge. Community involvement in the design and construction may have huge benefits in terms of community engagement, employment gains, falling crime and anti-social behaviour and also multiple cost saving.

### **9b. Eco-Retrofitting the existing housing stock**

Most of us in Herefordshire live in older, draughty, poorly insulated and thermally very inefficient housing. There is much work to do to improve them. Herefordshire Council could work with Bishops Castle Home Energy Service<sup>106</sup> who provide training in surveying houses and recently won The Big Green Challenge for this ground breaking work. The Home Energy Service is already operating in Herefordshire to a small extent, but there is great scope to roll this out across the County (Proposal 16). Kirklees Council<sup>107</sup> in Yorkshire started a programme of eco-renovation back in 1992, insulating

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<sup>104</sup> <http://www.novacem.com/>

<sup>105</sup> <http://www.calera.com/>

<sup>106</sup> <http://www.h-e-s.org/1/home.php>

<sup>107</sup> <http://showcase.hcaacademy.co.uk/case-study/kirklees-council-warm-zone.html>

properties and fitting solar panels. Kirklees provided free insulation at a modest cost to the Council but achieving a lot in terms of reducing fuel poverty, job creation and CO<sub>2</sub> reduction (Proposal 17). Berkeley in California provides another useful example in this area of eco-retrofitting. In 2007 they started Berkeley FIRST<sup>108</sup>, the “Financing Initiative for Renewable and Solar Technology” (Proposal 18). Councils pay for energy saving investments such as insulation or solar panels and re-coup the money over 20 years by adding a charge on Council Tax. This overcomes the barrier most often cited by householders, that of large upfront expenditure. Also as the charge is on the property and not the householder the fact that people may be contemplating moving house at some point becomes less of a barrier to making the necessary improvements. Putting Bishops Castles' surveying experience together with the pro-active leadership exhibited by Kirklees Council and the financial structure from Berkeley might be a path to the most widespread adoption of good eco-retrofitting.

### **10. Land Use, Food & Farming**

Current food, farming and land use systems are heavily dependent on fossil fuels. Saving CO<sub>2</sub> and safeguarding ourselves against the dangers of a post Peak Oil future are powerful reasons to change. Also global food systems hardly

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<sup>108</sup> <http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=26580>

seem to be providing humanity with optimum nutrition, with widespread malnutrition in the form of hunger in the poor world and obesity in the rich world. There are many examples of best practice from around the world which point in a different direction. Ecological restoration can be done hand in hand with increased economic growth, social and health related benefits.

### **10a. Urban and urban periphery food production**

Growing food close to where people live is key to cutting food miles, but also can have many other benefits, such as improvements to diet, exercise, health and fitness, while strengthening community cohesion, improving education and cutting anti-social behaviour. Allotments are currently in great demand as more and more people see the benefits of growing their own food. Kington in Herefordshire is one example of many where the anecdotal evidence is of multiple benefits.

Will Allen and the Growing Power organisation in Milwaukee<sup>109</sup> are an example of Community Supported Agriculture on a transformative scale. They started on a few acres of inner-city land in Milwaukee, in a run down area with high crime and anti-social behaviour rates and poor access to good fresh food. Will Allen and his team got the local disaffected youth involved in growing organic fruit and vegetables, keeping small livestock,

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<sup>109</sup> <http://www.growingpower.org/>

building soil fertility, generating their own power, running courses and working together in new and creative ways. Greenhouses and polytunnels are used to ensure year round production and additional training and education space. The farm has expanded onto other sites and employs dozens of full time staff and hosts thousands of visitors and volunteers every year and running educational courses has become a central part of what they do. There have been multiple benefits including improvements in diet, health, education and falling crime and anti-social behaviour, and by improving the soil carbon is sequestered and by replacing over processed food with local organic production CO<sub>2</sub> has been saved.

The Sekem project in Egypt provides another extraordinary example of what can be done<sup>110</sup>. In 1977 Ibrahim Abouleish bought land in the desert to start an organic and bio-dynamic fruit, vegetables, herbs and pharmaceutical based business that also demonstrated desert reclamation via building soil carbon, composting and green manuring. Impressive social and educational goals were also presented. Now with a network of 800 farms, thousands of employees and several very successful international businesses, they have just started their own fully accredited university. Could Herefordshire have a form of higher education provision that focuses on sustainability, food and

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<sup>110</sup> <http://www.sekem.com/english/default.aspx>

farming, and where perhaps as with the Milwaukee and Egyptian examples this emerges out of a radical form of farm diversification? (Proposal 29)

In Herefordshire we should reserve sizeable areas of land as close to where people live as possible for a diverse network of allotments and Community Supported Agriculture, with hopefully the best matching the achievement of Will Allen and the Growing Power team in Milwaukee (Proposal 23). Perhaps the White Cross, Broomy Hill, Adams Hill area might be one such local food production zone and the land between Newton Farm and Merry Hill another, but many other possibilities spring to mind and certainly smaller patches near houses have the potential to be very useful. Herefordshire's market towns should also be looking to improve food production within a short walk of consumers' homes.

### **10b. Farming and the Rural Landscape**

Farming in Herefordshire, as elsewhere, has become very dependent on high fossil fuel and chemical inputs, and very disconnected with the population who need to buy and eat food. Many Herefordshire farmers are in debt, find it hard to make a profit and have insufficient time and manpower to think and develop how they might do things differently. Joel

Salatin<sup>111</sup> at Polyface Farm provides a possible model for Herefordshire's livestock farmers (Proposal 24). Selling directly to the public and never to supermarkets is key to his very profitable farming operation that is also ecologically sustainable. He organically raises a wide range of pasture fed livestock, continually moving them onto fresh pasture every day, with for example poultry following cattle to clean the pasture and then giving it sufficient recovery time before livestock return. These grazing methods were written about by Graham Harvey in his book "The Carbon Fields". The capacity of soils to build fertility while sequestering carbon will be critical in the fight to prevent climate change. Future grants may be dependent upon the ability of farmers to do this, and it is also something that increased research and development needs to go into, and if Herefordshire is ever going to have higher education provision then it is this that should be a core research area.

There is an important role for Herefordshire Council to develop closer relationships between farmers and consumers. Local procurement for schools, hospitals and other institutional caterers can be important. Also, many schemes such as veg boxes, community supported agriculture, food co-ops,

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<sup>111</sup> <http://www.polyfacefarms.com/default.aspx>

“landshare” projects etc. can all help reconnect the people who grow food with the people who eat food.

The Soil Association has developed the “Food for Life”<sup>112</sup> initiative to try and improve the diet and knowledge of food amongst school children (Proposal 25). Schools to sign-up to use 75% non-processed food, 50% local food and 30% organically produced food. Farm visits are another aspect in helping children better understand food and farming while helping farmers develop better relations with consumers. By decreasing the number of “food miles” CO<sub>2</sub> is saved and, as children better understand food, hopefully diet and health can be improved and as farmers get to know and trade with their neighbours economic benefits will be generated.

There is a growing wave of interest in trees and woodland. Old skills such as greenwood furniture and building, hurdle making and coppice crafts in general are being revived. Wood as fuel is seeing a growth in demand, both as logs and for new uses such as wood pellets for boilers. If combined heat and power develops inside homes, larger community scale boilers may further increase demand. Biochar<sup>113</sup>, where wood waste, agricultural waste or even sewage can be mixed together and

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<sup>112</sup> [http://www.sd-commission.org.uk/communitiessummit/show\\_case\\_study.php/00132.html](http://www.sd-commission.org.uk/communitiessummit/show_case_study.php/00132.html)

<sup>113</sup> <http://www.biochar-international.org/>

burnt in a near oxygen free pyrolysis process, may in future be an important industry for carbon sequestration and soil improvement. This first will need research and development in which Herefordshire should seek to participate (Proposal 26). Carbon sequestration through photosynthesis will have many important aspects, whether through pasture management, greater use of timber in construction, logs and wood pellets as fuel, biochar production or plants such as miscanthus used to produce maximum biomass for fuel or anaerobic digestion. All these changes point towards new economic opportunities for rural Herefordshire while helping tackle climate change.

## **11. Business & Industry**

We live in a period of rapid change where the old “business as usual” models no longer apply. Forward thinking companies are developing the triple bottom line for looking at the social and environmental along with the economic aspects of the companies’ performance in their auditing process. As Amory Lovins and the Rocky Mountain Institute<sup>114</sup> have demonstrated, there is often money to be made out of changing to best ecological practice (Proposal 27). An efficiency revolution is changing how energy is used in the best practice industries and as energy is saved both costs and CO<sub>2</sub> levels are reduced. The

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<sup>114</sup> <http://www.rmi.org/rmi/About+RMI>

need for eco-retrofitting applies to business as much as to homes.

We live in fast changing times. Long established businesses are collapsing for a complex set of reasons, often with a destabilizing effect on local people. We see this in the local retail sector with the loss of Chadds and the closure of Woolworths. Ford, General Motors and Chrysler followed obsolete technology and business practices which has brought urban chaos to Detroit. Meanwhile other sectors of the global economy are booming. Baoding<sup>115</sup> in China provides an inspirational example of what can happen when a city changes direction. The mayor, Yu Qun, lead his city through a remarkably rapid transformation to become a hub for new industries associated with renewable electricity generation (Proposal 28). New companies such as e-Solar are developing at phenomenal speed. It is these future orientated industries that Herefordshire should seek to encourage. The hydrogen fuel cell car designed in Herefordshire by Hugo Spowers and Riversimple<sup>116</sup> is a rare example of innovation within the county. There are now, and will be, increasing opportunities for business as we make the transition from “The Fossil-fuel Age” to “The Solar Age” and

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<sup>115</sup> <http://www.csmonitor.com/Innovation/Energy/2009/0810/how-baoding-china-becomes-world-s-first-carbon-positive-city> (journalistic error: the term ‘carbon positive’ should read ‘carbon negative’.)

<sup>116</sup> <http://www.riversimple.com/>

carbon saving ideas, technologies and developments become increasingly rewarded. Herefordshire Partnership and Council have an important role to play in encouraging these new eco-businesses and new “green collar” jobs, and also in helping existing businesses start the energy efficiency revolution in their operations.

## **12. The potential for new Growth**

The future is unknown. Many threats exist, and none more extreme than climate change going unchecked and developing into so called “catastrophic climate change”<sup>117 118</sup>. Radical and rapid reduction in carbon emissions may be a pre-condition of humanity surviving into the Twenty-second Century. Nobody knows for sure, but we only have one chance to get this wrong and therefore a precautionary principle seems sensible. And as humanity strives to reduce carbon emissions many new and exciting opportunities are emerging. Herefordshire Partnership and the people of Herefordshire should embrace this transition and work together to maximize the benefits while we make this epochal change from “The Fossil-Fuel Age” to “The Solar Age”.

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<sup>117</sup> “Planet Earth We Have a Problem: Feedback Dynamics and the Acceleration of Climate Change. by Peter Cox, Deepak Rughani, Peter Wadhams & David Wasdell. Published by the All Party Climate Change Group, 2007

<sup>118</sup> “Six Degrees” by Mark Lynas Published by Harper Perennial, 2008 edition

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## Endnote

This document is far from definitive. Many other inspirational examples could have been chosen. I'd like everyone reading this to think of an example which could work in Herefordshire and send it to the New Leaf website<sup>119</sup> (Proposal 30). Many minds working together can produce extraordinary results, sometimes without centralized control; the Internet and Wikipedia are two that come to mind.

The proposals I've written about need to be developed and added to, but they do at least indicate an outline of a possible low-carbon development scenario for Herefordshire.

I would very much like to be part of a process developing feasibility studies from one or more of these proposals.

Richard Priestley

April 2010

If you would like to know more about Herefordshire's emissions visit the [New Leaf](http://www.herefordshirenewleaf.org.uk/) website

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<sup>119</sup> <http://www.herefordshirenewleaf.org.uk/>

