SUFFOLK LOW CARBON CHAMPIONS

An alternative review

INTRODUCTION

This brief report summarises research carried out as part of the Suffolk Low Carbon Champion evaluation project. Findings are derived from the author's involvement in the LCC programme in a number of ways: participant (sponsor for Strident Group, the first organisation to join LCC), researcher (associated with the main evaluation project[1]) and practitioner (as someone who runs a small business).

Content and tone is influenced heavily by the author's interest in critical management studies (CMS). These challenge the existing, taken for granted or naturalised order; question maximisation principles i.e. maximising output for a given input at the expense of deeper ethical, social and political issues; and recognize that all accounts of organisation and management reflect the experiences and opinions of the authors (Fournier & Grey 2000, p.9).

Neither the research nor this report has any explicit purpose other than to fulfil my commitment as a low carbon champion. I prefer action to words so will be trying to implement the recommendations personally and will provide further updates shortly.

Richard Parker, 15 March 2013

RESEARCH SUMMARY

Research activity

Although the Suffolk LCC programme started in early 2010, this contribution to the evaluation programme only began at the end of 2011. [2] Findings are based on work with the programme managers at GLT, the evaluation team at Essex University and interviews with LCC participants during 2012. In early 2013 qualitative comparative analysis was used to start to try to provide a deeper understanding of empirical evidence.

Full details of research may be published elsewhere but key elements of research activity are shown below to provide a background to this report and are supported by appendices where appropriate.

Definitions of success

One of the toughest decisions to make was to define success. After much debate, absolute measures of progress (e.g. carbon reduced, charter level achieved) were rejected and relative definitions of success were chosen. These were business distance travelled (policies, plans, etc.) and emotional distance travelled (interest, commitment, engagement, etc.) and cases in cohorts 1 to 4 were graded on this basis by colleagues at Green Light Trust (GLT).

The results were contradictory: by ignoring starting positions, measures of distance travelled produced anomalies whereby already 'deep green' organisations were deemed less successful than environmentally weak cases which had made major progress. Clearly the definition of a case was incorrect and LCC participants needed regrouping on something other than cohort.

[1] This involvement was completely independent of the primary contractor (Essex University) and this report does not represent their views in any way.
[2] This was due to the termination of the previous evaluation project by the Open University.

It was felt that emotional distance travelled and business distance travelled were good indicators in the battle to win hearts and minds respectively. The original cases start and end scores on each measure were used to plot start and end positions on a 2 x 2 matrix. The Wizard of Oz provided a useful metaphor and in the tale three characters help Dorothy on her journey: the Scarecrow (who lacks a brain), the Tin Man (who lacks a heart) and the Lion (who lacks courage). They seek to find the (conveniently green) Emerald City and in the process acquire the things they lack. Each cohort was mapped to these four quadrants (see figure 1 for cohort 1).

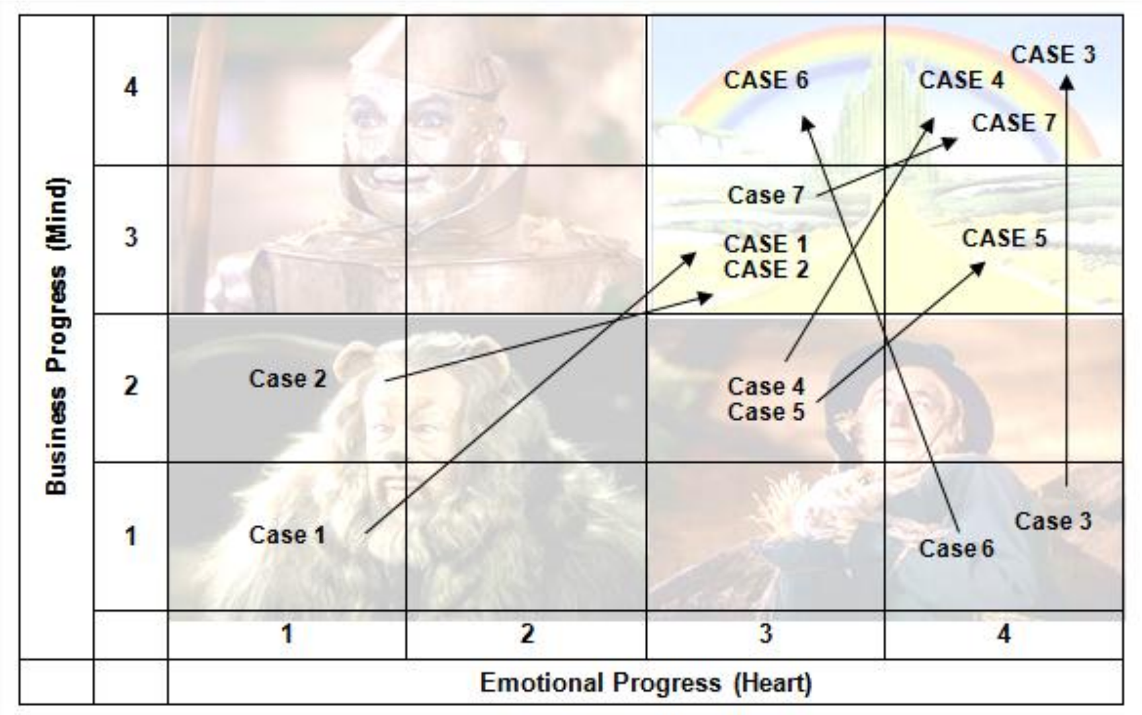

Figure 1: Wizard of Oz metaphor for business and emotional distance travelled (Cohort 1)

Whilst the Wizard of Oz metaphor was a useful start, it only really explored outcomes at one level i.e. what we might mean by organisational success – a one-dimensional perspective which has been criticised before (Jenkins 2006; Crocker 2012). This is a failure in other research (Parker et al. 2009) and assessing our outcomes at different levels enables more objective coding and allows multiple definitions of success to be used in the project.

Multiple levels of analysis

The primary level of analysis throughout the evaluation was the organisation. Blundel (2008) recommends evaluating at five levels but for the size of this project it made sense to drop one (group) and simply use individual, organisation, community and society as the broad levels of context.

Whether by design or by accident: mentoring and training impact directly on individuals, audit and grant impact directly on organisations and charter impacts directly on communities. This allowed the deconstruction of the 'what works for whom' question. For example, mentoring and training might work at an individual level but small organisation size and the failure to save any meaningful amounts of carbon means it fails at the society level.

Contexts, mechanisms and outcomes

This research activity borrows heavily from Pawson & Tilley's realist ideas around generative causation which suggests that outcomes are explained by mechanisms acting in context. Our four context levels together with suggested outcomes at are shown in table 1.

Level	Definition	Evidence
Individual	The champion (and sponsor?) benefited personally from the LCC programme.	Deep learning.
Organisation	The organisation benefitted directly from the LCC programme.	Internal cost savings. Effective carbon policy. Promotion of charter.
Community	The local community benefited from the LCC programme.	No and level of carbon charter. Active promotion to local peers.
Society	Significant carbon savings were made to the indirect, long term benefit of all.	Carbon reduction.

Table 1: LCC outcomes at different levels

The mechanisms which might be triggered by the LCC actions are typically described as drivers and barriers (Crocker 2012; Federation of Small Businesses 2007; Arnold 2007; Jenkins 2006; Torugsa et al. 2011; Natarajan & Wyrick 2011; Parker et al. 2009; M. Seidel et al. 2008; Young 2010) and are summarised in table 2. These are grouped by level and whether internal or external in origin - an important difference and is discussed further later.

I/E	Level	Drivers	Barriers
INTERNAL	Individual	+ Do the right thing + Go green + Gen Y / Z + Spot opportunities	- Lack of time - Looking foolish - No motivation - No influence
	Organisation	+ Inc sales, cut costs, inc profit + Improve image / offers + Improve quality / service + Improve CSR / culture / change	- Lack of time - Lack of money - Lack of people - Lack of motivation - Lack of knowledge
EXTERNAL	Community	+ Customer pressure + Competitor pressure + Supplier pressure + Community pressure	- No customer pressure - No competitor pressure - No supplier pressure - No community pressure - Unsupportive landlord
	Society	+ Reduce carbon + Reduce waste + Reduce water use	? Legislation ? Guidelines ? Fines

Table 2: Typical LCC mechanisms

Pulling the above together suggests a simple model with four levels of analysis. It is of course not as 'black and white' as this, but looking at levels helps overcome the problem of defining 'success' by acknowledging it means different things in different contexts.

An apparent but maybe unintended strength of the Suffolk LCC is that programme actions impact at three out of four levels. [3] The task of the researcher is now to propose and hopefully identify successful combinations of contexts, mechanisms and outcomes (CMO Combinations). In a typical iterative evaluation programme actions are changed to see if different mechanisms are triggered in similar contexts. In this programme actions were largely constant across cohorts and it was contexts that differed i.e. different types of case. The resulting model is shown as figure 2 and forms the basis for initial qualitative findings and subsequent qualitative comparative analysis.

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[3] *Society is the same for all cases and therefore of less relevance (an ontological condition).*

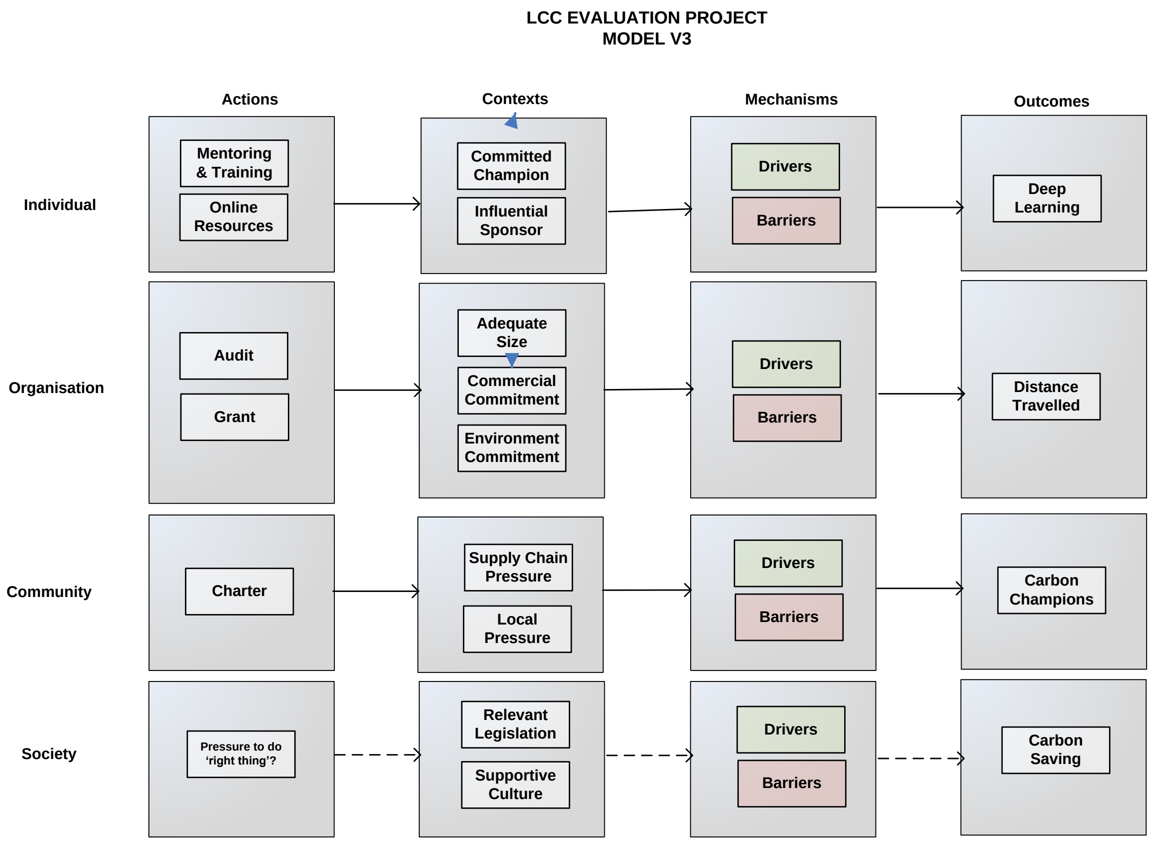

Figure 2: LCC actions impact on CMO configurations at many levels

Current activity

Work is currently underway using QCA to try to identify successful CMO configurations but this has proved problematic for a number of reasons (see appendices 1 and 2). The work has however supported results from earlier cohorts (see figure 6, p 16).

RESEARCH FINDINGS

Individual level

At the individual level, a committed champion and influential sponsor are likely to be necessary for success. The LCC action which impacts on them is primarily the mentoring and training which can result in deep learning.

A successful project outcome depends largely on the ability to not only find an effective individual champion but for him or her to translate their organisations into low carbon champions too. This organisational change depends on the other individual involved, the sponsor, and the level of influence he or she might have. The champion / sponsor divide is less marked in micro and sole trader cases where both roles are often fulfilled by the same person. In others the strength of one compensates for weakness in the other.

These four possible combinations are shown in table 3.

Sponsor Influence		Champion Commitment: Low	Champion Commitment: High
	High	**Frustrated Ambition**	**Dream Team**
	Low	**Train Crash**	**Stool Pigeon**

Table 3: Sponsor / champion configurations

It is clear that the mentoring and training element of the intervention is critical to the process of creating successful individual outcomes. Online resources also support personal development but appear to be of significantly less impact.

The repeatedly-stated aim of the LCC programme is for the deep-learning necessary to support long-term sustainable change. It is perhaps too early to say whether this has definitely been achieved although the response from respondents was very positive. What is clear is that the departure of individuals is usually a sufficient condition [4] for an unsuccessful outcome. Of the cases which failed during the programme, most were due to the departure of nominated champions. The importance of getting the right people cannot be over-stated.

Organisation level

The primary focus of the research is at organisation level and can result in very different types of case. Our original 'Wizard of Oz' metaphor which arose from discussions with GLT remained resilient and was found to resonate well with the literature and is subsequent QCA testing. The primary aim the LCC programme remains changing the hearts and minds of small business – a measure which we have called distance travelled.

The 'Wizard of Oz' metaphor which helped map emotional and business progress is supported by the commercial and environment commitment ideas found in the literature (table 4). Blundel et al (2008) base their framework on the work of Spence and Rutherford's (2001) earlier study to map organisations by commercial orientation and attitude to social change (the paper looks more at broad corporate social responsibility than narrow carbon reduction). Parker et al (2009) modify this slightly to categorise firms based on performance and environmental commitment. Both resonate with our perhaps more memorable Wizard of Oz framework. [5]

[4] *When a combination is sufficient for an outcome, all instances of the causal combination should be followed by the outcome in question. When a causal combination is necessary for an outcome, all instances of the outcome should exhibit the same combination of causal conditions.*

[5] *Putting cases into boxes based raised the question of why there were no Tin Men? The answer probably is that the LCC programme simply doesn't appeal to those sorts of companies but this is discussed further later.*

Commercial Orientation / Degree of Performance Commitment / Business Distance Travelled	High	**Profit Maximisation Priority** **Profit Driven** ***Tin Man***	**Enlightened Self Interest** **Advantage Driven** ***Emerald City***
	Low	**Subsistence Priority** **Compliance Driven** ***Lion***	**Social Priority** **Environment Driven** ***Scarecrow***
		Low	High
		Social Change / Degree of Environmental Commitment/ Emotional Distance Travelled	

Table 4 Mapping of Business vs. Environment Frames
(Adapted from Blundel et al. 2008 and Parker et al, 2009)

The sector in which the organisation works in often considered important (Crocker 2012) but with only very few cases outside of the service sector this was not felt to be an important factor in this research. Social enterprises were included in the initiative and had their own cohort which may merit further analysis in the future. Comparing LCC data with other more diverse programmes is another option.

Organisational size is important however and there are a lot of micro-organisations and sole trader cases in the programme. This clearly has an impact on the potential size of the carbon savings in absolute terms. Given the cost of programme delivery it is surprising that there was no threshold on size for the full programme or a change to the scope of delivery other than a shorter audit for the small social enterprise cohort.

Stage of the business life-cycle is another consideration and growth orientation might also impact (Jenkins 2006). This factor was allowed for by using business and emotional distance travelled as a proxy for maturity. On initial evidence, mature or static organisations didn't appear to have any lesser desire to lower carbon emissions.

Community level

The community context is often overlooked but is critical to this project. Without the intervention and active support of Suffolk County Council the LCC programme would not exist. The funding and awarding of charter is their main intervention and although awarded to organisations the number and level of carbon champions is currently more a community outcome than an organisational one.

It is important to consider the local community in which the organisation operates (Federation of Small Businesses 2007) as small organisations and the people who run them typically buy and sell locally, will often be well-known and their actions visible to others (Howarth & Fredericks 2011). Clearly this is where the intervention of Suffolk County Council, GLT and the other local bodies become involved and the charter is the artifice by which the council chooses to measure the progress towards what it defines as best practice.

Participants mention the possibility of using the charter for promotion purposes but this value is limited to within the county and may be perceived as somewhat irrelevant outside of it. The costs of continued monitoring and renewal mean even those that have the charter might question the need to renew it. The aim of gold level charter is to drive change within the community through supply chain changes and local champion promotion. A worthy idea but is it working?

Society level

And finally society, which defines the legislative and cultural context in which the LCC programme operates. Interestingly, the main measure of organisation success – carbon reduction – only really applies to this level.

Society is perhaps the ‘elephant in the room’ in this project as the only direct benefactor of the primary LCC initiative objective i.e. to reduce carbon emissions. It is interesting to see how the literature has changed over the past twenty years to reflect this change in society. Earlier work clearly stressed the need for government intervention to legislate and force organisations to work in more environmentally friendly ways (Hart 1995; Welford 1995; Revell 2003; Revell & Blackburn 2007) whilst more recent work reflects the acknowledgement within society of the need to change the ways we work (Kechiche & Soparnot 2012).

Society’s impact on the Suffolk LCC initiative is acknowledged but not developed further as it is consistent across all cases in all cohorts. This is unlikely to have changed significantly over the past fifteen months but might if future projects support a more longitudinal analysis.

CONCLUSIONS

Conclusions from the research conducted so far are listed below in no particular order. Supporting references from previous research are listed where appropriate.

1. Holistic approach works in most cases

The comprehensive nature of the LCC programme means it has the breadth necessary to potentially achieve low carbon reduction in most contexts. Mentoring, training, audit, grant and charter all mapped well with three levels of analysis – individual, organisation and community respectively – to help ensure outcomes are successful for all stakeholders.

The majority of the literature suggests that the biggest barriers and drivers to SME carbon reduction are internal (Crocker 2012) and the LCC programme works well to address these. A survey by the Federation of Small Business (2007) found that lack of time and lack of money were biggest impediments and LCC provides both. Parker et al (2009, p.16) argue that few interventions work on their own (see table in appendix 4) and LCC fares marginally better than the audit only control group (ref).

2. Balanced approach helps deliver strategy

LCC interventions also mapped well within organisational functions. Using Kaplan & Norton’s (1996) balanced scorecard as a guide, the programme initiatives fit with the four scorecard perspectives and suggests a good contribution to delivering overall business strategy. [6]

1. Availability of grant (finance perspective)
2. Marketing potential of charter (customer perspective)
3. Audit and policy / EMS (internal process perspective)
4. Mentoring & training (learning & growth perspective)

The literature supports this balanced approach by stressing the value of EMS/ Policy (Friedlander 2010; Young 2010), the value of mentoring (Friedlander 2010) and facilitating (Howarth & Fredericks 2011; Newell & W. B. Moore 2010; Klewitz et al. 2012) and collective learning (Crocker 2012; Arnold

[6] *The balanced scorecard has potential here. By asking ‘what do we have to do today to compete tomorrow’ it addresses fundamental, long term strategic issues. Other authors see its potential too* (see Figge et al. 2002).

2007; Parker et al. 2009; Clarke & Roome 1999; Jenkins 2006; Klewitz et al. 2012). In the FSB survey, 76% of respondents would welcome financial incentives. [7]

3. Only low hanging fruit harvested

The apparent lack of Tin Men is concerning and suggests that the programme has only appealed to 'low hanging fruit'. This might be due to errors in coding (this is being checked) but the preponderance of Lions and Scarecrows suggests many cases were already green and simply wanted a framework to build on further. There is nothing inherently wrong with this but it does diminish the value of the programme and will impede further penetration.

It is worth stressing that the business distance travelled measure refers largely to the extent to which cases developed environmental processes not necessarily a higher commercial commitment. That said, the apparent lack of development of environmental commitment is concerning.

4. SME diversity needs programme diversity

Large scale, publically-funded interventions such as Suffolk LCC often lack the flexibility to adapt to the needs of SMEs vary significantly in size, structure and purpose (Crocker 2012; Loucks et al. 2010; Albareda et al. 2008). It is important that SMEs are not treated as an homogeneous group when studying their environmental improvement but 'instead group them according to attributes such as business performance commitment' (Parker et al. 2009, p.17). Our research has attempted to do this with the Wizard of Oz metaphor for organisations but still has more work to do at other levels.

Whist others commented that they enjoyed the variety of organisations at group sessions, resources might have been better allocated if the programme was more flexible in the way that it met the very different needs of organisations. Friedlander et al (2010) describe how SMEs were separated into three categories based on their EMS development potential and helped targeted accordingly. Whilst the one-to-one mentoring element provided the flexibility needed to address individual needs there was little scope to adjust delivery between sole traders and organisations employing hundreds of people.

The carbon audit may have been relevant to the larger participants but whilst popular with the organisations which had them appeared to be overkill for the majority of cases. This fact was belatedly recognised in later cohorts which had a simpler audit service.

Flexibility might also be needed in terms of cost of delivery. Each intervention cost a significant sum to deliver and whilst providing good value for larger organisations with significant scope to reduce carbon emissions, was poor value when applied to sole traders and micro businesses.

5. Too many cooks

The involvement of so many bodies in the delivery of European funded programmes (eight at the last count) meant that it was often unclear who was managing what. The involvement and role of Suffolk County Council as the driver and funder of the LCC programme was not immediately apparent.

This matters as stressing the local aspects of such programmes is important in the SME sector (Hansen et al. 2010; Natarajan & Wyrick 2011; Revell et al. 2008). The literature suggests that small business owners / managers recognise they have a responsibility to support their communities and the primary stated motivation is the expectation that it would contribute to business success – the enlightened self- interest rationale (our Emerald City) (Besser 2012). Crocker (2012, p.253) too notes

[7] *You wonder why the other 24% wouldn't.*

that 'whilst the business case was integral to most SMEs, it is important to emphasise that businesses also showed a clear personal drive 'to do good' within society'. A survey found that overall 92% of respondents considered their businesses to be socially and environmentally responsible (Federation of Small Businesses 2007).

Suffolk County Council's significant contribution appeared diminished when compared to that of GLT, Groundwork and other delivery partners. Those involved may all know how these things work; SMEs don't. Not foregrounding the council and building greater county-wide community might come back to bite when renewal is due and people question the relevance of the charter.

6. Small companies are not small big companies

Formal written policies are rare in SMEs yet are required to underpin the LCC programme yet the same tools and approaches which apply in large organizations might not necessarily work in small ones (Parker et al. 2009). Whilst it can be argued that written evidence is required for audit and evaluation the setting of objectives could be done in ways which better engage with micro organisations. Grant funding was not always taken up as the costs (match funding and time to complete) outweighed the benefits for many micro organisations.

The Carbon Log submission form was over-complicated, seldom used and contributed to the reluctance to report progress. Achieving a simple change in attitude as opposed to measuring complex carbon reductions might be better in future (Parker et al. 2009). The Federation of Small Business was blunter: 'Time spent filling in forms to prove that businesses are acting in a socially responsible manner is time that could be better spent actually doing it.' (2007, p1).

7. Weak use of technology

Use of information technology (especially the internet) was limited and might have been better used to help GLT colleagues drive and build community during the programme. [8] A 'Linked In' group was started but gained little interest. The opportunity for technology to support a more flexible and blended approach in programme delivery might exist but has not been exploited.

8. Hard to scale up

High face-to-face content and meetings in Lawshall were an undoubted strength of the programme. They also mean it might be hard to deliver across a wider geography without increasing the carbon emissions involved in such travel.

The reliance on a three key GLT colleagues to deliver the programme also means it might be hard to penetrate further in Suffolk or replicated across other reasons if delivered in the same intensive manner. People are costly too and the funds to deliver LCC in its current format are unlikely to be adequate.

9. Something for nothing

The delivery of LCC at no cost to organisations was almost certainly a necessary factor in its success. It is highly unlikely many would have taken it up without subsidy and it will be interesting to see what renewal rates are when earlier cohorts become due later this year.

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[8] *The notable exception here was Liz Moss's programme spreadsheet which contained more information than I have ever seen squeezed into one Excel application.*

Whilst making LCC free at the point of delivery (at least for micro businesses) is likely to remain important, getting some contribution to programme cost might increase the perceived value. An idea might be to make progress reporting a condition of acceptance with possible financial penalties for failure. Disclosing the cost of the programme in terms of per company or per ton of carbon lost might backfire if local rate payers perceive this to represent poor value.

10. Start evaluation from the start

The evaluation project has been incredibly difficult to deliver as despite there being a vast amount of data collected much of them were not in a format that made evaluation easy. This included a tenuous measure of carbon saved based on number of actions.

Deciding what success means and collecting evidence along the way would make evaluation much simpler. The ability to regularly review success in between cohorts would also allow changing actions to identify more effective CMO configurations as opposed to a fixed delivery programme.

11. Drop in the ocean

It is estimated that Suffolk LCC saved 1.7 kilotons of carbon. That's good, but represents just over half of one percent of the county's 2020 reduction target of 297 kilotons. At a delivery cost of £667k (including matched funding) a budget of £133.4m will be needed to roll the scheme out to all that need it and achieve the 15% overall reduction required. That's £133.0m more than the money currently available.

Part of the cost is the inevitable administrative burden imposed by European funding. Even without this, simply scaling up LCC in its current format is not feasible. Applying the lessons learned to more efficient and effective method is the best that can be hoped for.

12. Missing links

Confusing outcomes at different levels makes it harder to motivate potential or current participants. The primary LCC purpose is to lower carbon which only applies to the society level unless individuals are already personally environmentally aware. Appealing to internal and external business drivers at the organisational level will be needed to recruit more Tin Men.

RECOMMENDATIONS

If Suffolk is serious about becoming 'The Greenest County' it is unlikely to fulfil its ambition using LCC in its current format. The cost of each ton of carbon saved is simply too great. Even if there were unlimited funds (and people to spend and administer them) it is uncertain that the county's profit-maximising Tin Men would join in given their lack of interest even when free.

The existing model is somewhat self-serving and unless new ways of looking at the problem are found radical change is unlikely to be driven from within. 'New tools are needed' (G. Moore & L. Spence 2006; Morsing 2006; Loucks et al. 2010; Thyil & Wise 2010) and a few that might be worth exploring are …

Embrace technology

The only way to deliver tailored solutions to a large, diverse SME audience to a similar standard as LCC at fraction of the cost is through technology.[9] Blended delivery [10] using on-line resources that can be delivered completely through distance learning at one extreme (smaller, remote or poor organisations) or as the foundation for three or more days on-site at the other (larger, local or wealthier) is the only likely option. [11]

Delivery of the programme could be either in cohorts at a fixed pace (content released weekly or monthly) or on a stand-alone basis (all content available from start) to reflect different levels of ambition and learning styles. Integrating other elements (audit, log, evaluation, grant, offset, etc.) on-line using innovative methods and technologies will reduce confusing, cumbersome and costly administration.

Cost is front-loaded but once created the ability to scale up is only dependent on the number of 'tutors' needed to support the course. [12] These could be employed on an hourly basis - another disruptive idea. For smaller organisations, a simple web-based questionnaire plus two hours of analysis possibly supported by video evidence [13] could be delivered with no travel and at a tenth of the current cost.

Ground methodology

The top-down, 'we know best' approach currently deployed is difficult to scale up without significant additional cost. A bottom-up approach would involve the champions more in actively promoting the scheme to peers. This has, of course, always been the intention.

A more grounded, inductive method would be to use something like Positive Deviance (www.positivedeviance.org) to identify best practice within the community then support its spread to similar organisations. If successful this too would enable high penetration in the population at minimal cost.

Back to business

Neither of the above is likely to get Suffolk's Tin Men marching to find a heart. Cold, logical business benefits (increase sales, cut costs, reduce risk, etc.) might and these need stressing more than environmental benefits.

There is a lot of evidence to suggest sustainable business is going to be THE key to competitive advantage in the near future (e.g. Nidumolu et al. 2009). Such a message can be delivered externally but also through the eLearning resources too. Stressing external business drivers rather than relying on internal personal ones will be key here.

[9] *The Open University call this 'breaking the iron triangle of accessibility, quality and cost'.*
[10] *One that combines distance and face-to-face learning*
[11] *These need not be costly given the amount for free resources now available and delivered via MOOCs*
[12] *I plan to build a simple site on this basis with intern assistance this summer*
[13] *Why not write a carbon audit app to do the job? Or create a dedicated SCC video channel?*

APPENDICES

Appendix 1: Realist Research

Investigation has been based upon Pawson & Tilley's (1997) realist evaluation ideas. [14] These propose a realist evaluation cycle (figure 3) of iterative activity.

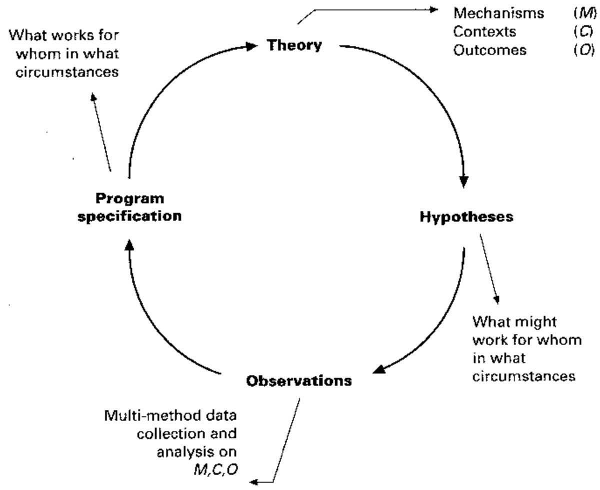

Figure 3: Realist Evaluation Cycle (Pawson & Tilley, 1997, p85)

Realist research is based on realist ideas around generative causation which suggests that outcomes are explained by mechanisms acting in context (figure 2).[15]

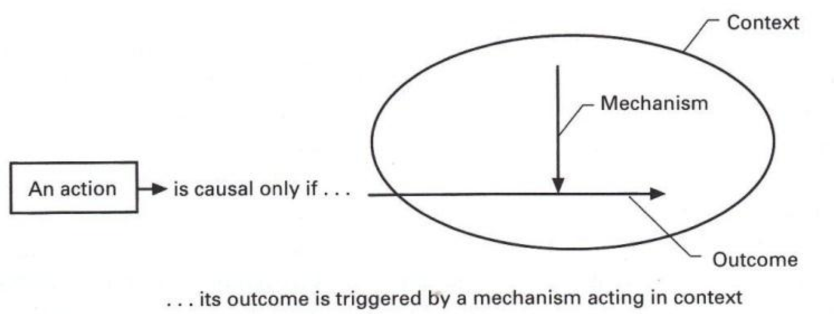

Figure 4: Generative causation (Source: Pawson & Tilley 1997, p.99)

To evaluate whether an action is causal we have to look at combinations of context, mechanisms and outcomes (CMO) and try to explain rather than simply describe what is going on. This is not easy and typically during such a programme in other social research the contexts remain constant (e.g. deprived areas) and the actions are (e.g. steps to alleviate poverty) are changed and outcomes evaluated and mechanisms suggested.

In this project it is the actions which have remained broadly the same (i.e. the LCC interventions) and the contexts which have changed (i.e. the organisations to which they were applied). Identifying the CMO configurations in these cases therefore required defining contexts, describing what successful and unsuccessful outcomes look like then suggesting mechanisms which might explain them.

[14] *Although not explicitly acknowledged as such, these have a lot in common with critical realist retroductive / abductive research strategies.*
[15] *This worldview may come as a surprise to those used to output from a frequently un-real CMS community.*

Appendix 2: Qualitative Comparative Analysis (QCA)

QCA uses set theory to help identify combinations of causal conditions. Each case is carefully calibrated to the extent that outcomes (e.g. carbon reduction) and possible causal conditions (e.g. individual distance travelled) are member of sets. The critical half way point determines whether they are more in than out of the set and is used to assign a 0 or 1 for truth table analysis.

A truth table simply counts the number of cases with the same combination of set membership but is still a useful device to understand what is happening before conducting more complex set reduction. In the simple example shown in table 9, 46 organisations (92% of all cases) were rated above half-way and therefore more in than out for business commitment (bizend) and environment commitment (greenend).

bizend	greenend	number	carbonred	raw consist.
1	1	46 (92%)	1	0.762162
0	1	2 (96%)	1	0.857143
0	0	1 (98%)	0	0.775000
1	0	1 (100%)	1	0.863636

Table 6

The high consistency figures suggest that having high commercial and environment commitment will contribute to carbon reduction which is hardly surprising. What QCA also allows us to do is to show how these conditions combine to produce result and the separate rows in table 10 suggest that either high green OR high business scores at the end can explain a successful outcome.

```
                 raw        unique
               coverage    coverage    consistency
              ----------  ----------  ----------
greenend       0.949367    0.056962    0.750000
bizend         0.905063    0.012658    0.733333
solution coverage: 0.962025
solution consistency: 0.723810
```

Table 7

Looking at organisation distance travelled sheds a little more light. Here the most frequent combination is business distance travelled (1) but NOT green distance travelled (0). In table 11 only fifteen cases did both but the higher consistency suggests they accounted for more carbon reduction than business distance travelled alone.

bizdt	greendt	number	carbonred	raw consist.
1	0	26 (52%)	1	0.809917
1	1	15 (82%)	1	0.887097
0	0	9 (100%)	0	0.712766
0	1	0 (100%)	0	0.939394

Table 8

This tends to support our earlier assertion that organisations joining LCC were already green (i.e. a self-selecting sample) and gained mainly by acquiring the business process element (scarecrow in our Wizard of Oz metaphor). The fact that there was no green distance travelled alone (row 4 above) backs up our earlier assertion that there are no Tin Men seeking hearts either. By simplifying this in QCA we can see that business distance travelled alone accounts for the majority of carbon reduction (table 12).

```
                  raw       unique
                coverage   coverage   consistency
               ---------- ---------- ----------
bizdt          0.765823   0.765823   0.790850
solution coverage: 0.765823
solution consistency: 0.790850
```

Table 9

Showing individual case scores in an X-Y plot [16] with carbon reduction in the x axis and green distance travelled on the Y axis shows most are in the bottom right corner (figure 5). This suggests that green distance travelled is a subset of carbon reduction and therefore a necessary but not sufficient cause i.e. all instances of the outcome should exhibit the same causal condition.

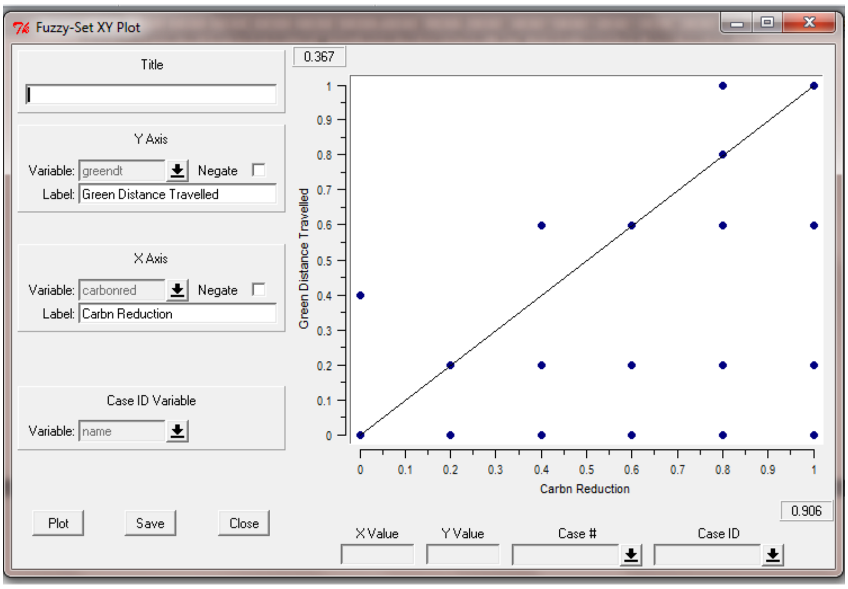

Figure 5

Conversely, business distance travelled shows no consistency at all (figure 6).

[16] *This is another useful tool in the QCA armoury*

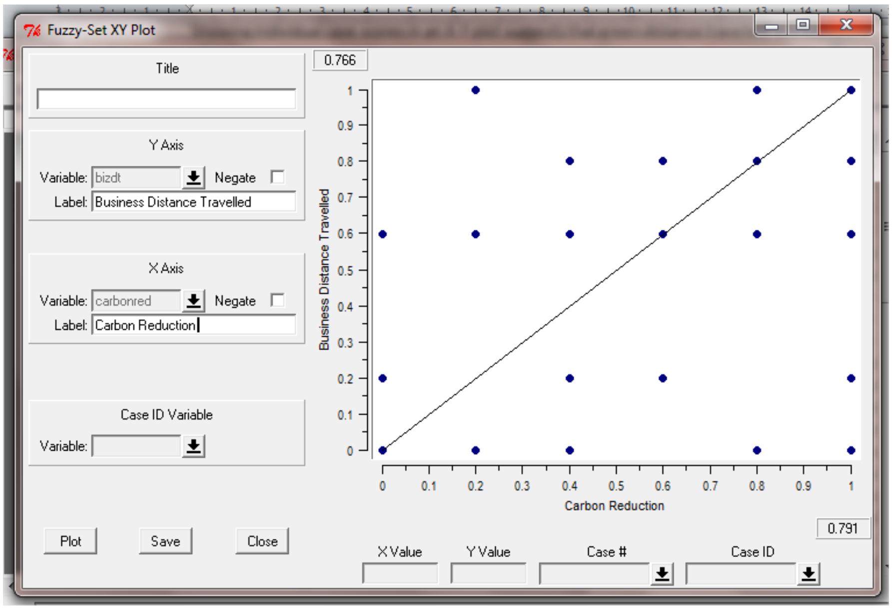

Figure 6

As distance travelled is already a function of end minus start positions what might be more useful is to look at how these were derived.

Looking at both start and finish scores for business and environment commitment (table 13) increases the combinations to 16 (2 to the power of 4) and it's interesting to see which combinations are not used (logical remainders or counterfactuals). Only one combination with a strong business base recorded any cases (row 3) and these explained unsuccessful cases (raw consistency < 80%). This suggests that no green distance travelled plus some business travel is still insufficient to reduce carbon emissions.

bizbase	bizend	greenbase	greenend	number	carbonred	raw consist.
0	1	0	1	17	1	0.851064
0	0	1	1	2	1	0.842105
0	1	1	1	16	1	0.820225
1	1	1	1	13	0	0.693878

Table 11

Re-visiting our earlier metaphor suggests that lions (row 1 above) and scarecrows (row 3 above) did explain the majority of carbon reduction. The two cases which stayed as scarecrows (row 2) still reduced carbon significantly but those who were already in Emerald City (row 4, 13 cases or 25% of the sample) did not.

Plotting these in our original Wizard of Oz image is shown as figure 7. QCA suggests the findings in the earlier cohorts were replicated the entire programme.

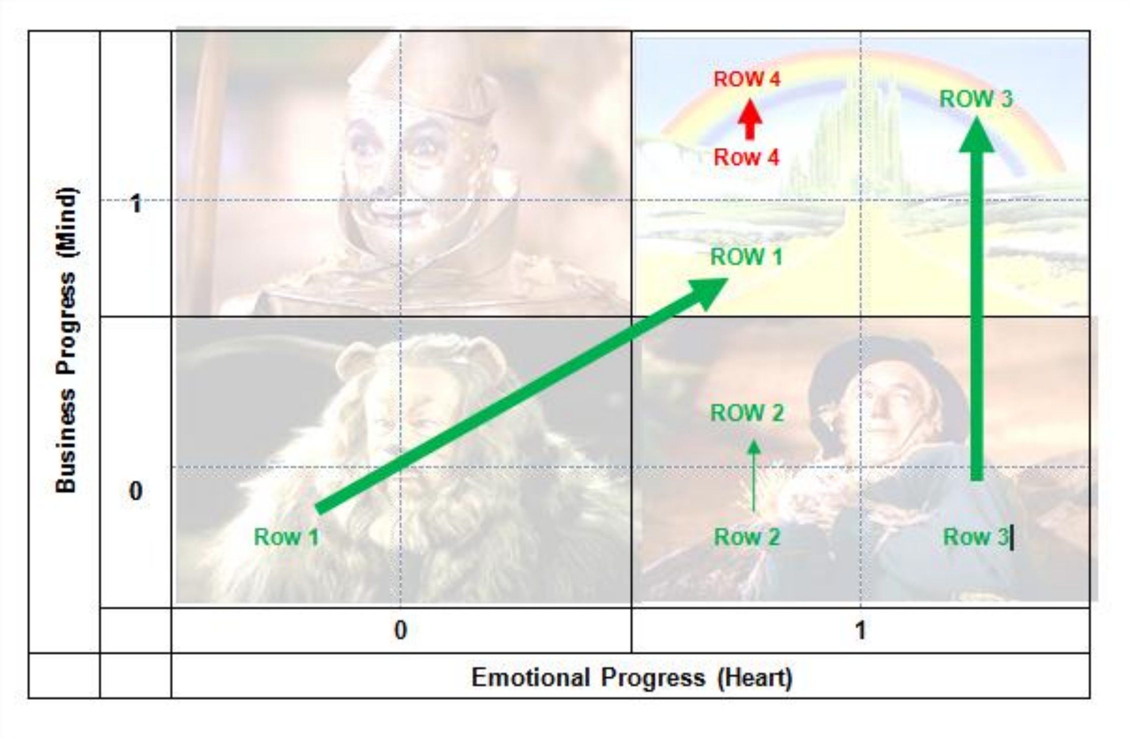

Figure 7: Original Wizard of Oz metaphor mapped with QCA findings

This resonates with earlier research where carbon reduction programmes have been mapped to commercial and environmental commitments (figure 1, page 2).

The carbon reduction results have only recently become available so there is lots more work to do especially around, for example, the impact of size and individual distance travelled to assess the likely importance of champion and sponsor. This brief contribution hopefully gives some indication of the potential of the QCA approach.

Appendix 3: Research Review

The original research aim was to discover the combinations of contexts and mechanisms which explain successful and unsuccessful outcomes. This means not simply across each level but between them too. For example, community level success (number of carbon champions) will depend on individual, organisational and community context / mechanism combinations. Note: society is irrelevant in this study as is the same in all cases (an ontological relationship).

This is complicated but the QCA method is designed find out the combinatorial logic explain successful and unsuccessful outcomes in terms of combination of necessary and sufficient conditions. Whilst this allowed some broad conclusions it certainly did not permit the identification of the CMO configurations suggested above in time for this report. This is due to a number of reasons.

Late availability of case data. The number of cases needed to run a fuzzy set analysis only became available recently and it has been a hard to analyse data in a short time.

Short report deadline. The true impact of the LCC programme will take longer to gauge than a few months after the last cohort. A longer period after programme completion is needed to assess findings, especially on charter renewal uptake.

Lack of familiarity with the cases. This makes it difficult to confirm detailed contexts or impact of actions. It is probably too late to find these data now and a closer researcher involvement during the programme would have helped.

Lack of diversity in outcomes. Nearly all the cases were deemed successful within the terms of the programme i.e. at least 10% carbon reduction. This made it difficult to identify necessary or sufficient conditions which need unsuccessful cases as part of the QCA process.

Lack of diversity in actions. Most cases received the same combination of LCC actions, the main exception being those that had an audit delivered previously. The research should (and still can) compare different combinations to see whether some were more or less successful. So far, the only comparison has been with cases that had the audit only. An action research approach with subtle changes made and assessed between each cohort might have worked better.

Appendix 4: Mixed Intervention Framework

Intervention	Effective when ...	Ineffective when ...	Most effective for …
Voluntary regulations and standards	• driven by personal ethics • external demand for compliance	• it is the only intervention • no awareness of regulations • barriers are greater than benefits • no demand for compliance	Environment-driven Advantage-driven
Compulsory regulations	• it is clearly communicated • provides equity for all firms • combined with financial penalties • financial support is provided	• it is the only intervention • no awareness of regulations • perceived as a business threat • not monitored or enforced	Compliance-driven Advantage-driven
Financial penalties	• linked to regulatory framework • makes bad practice unviable	• it is the only intervention • penalty too small to be noticed • no viable penalty possible	Compliance-driven Profit-driven
Financial support	• promoted clearly/directly to SMEs • simple to apply for • offset regulation compliance costs	• it is the only intervention • too difficult to apply for • criteria are too restrictive • only a temporary measure	Environment-driven Advantage-driven
Self-directed and facilitated education	• linked to regulatory framework • tailored to individual firm needs • it has a specific problem focus • run by trusted/credible parties • promotes a change in attitude • encourages learner interaction • it uses business language • helps firms gauge their progress • helps to identify opportunities • learning is actionable immediately • provided conveniently to firms • includes real examples/cases	• it is the only intervention • providers do not know SMEs • does not address specific needs • providers are not credible/trusted • too many information sources • lack of knowledge integration • it uses sustainability language • it is too expensive to attend	Environment-driven Advantage-driven *It is challenging but possible to provide education for:* Compliance-driven Profit-driven
Audits and reviews	• used with education • identifies short-term benefits • performed by trusted parties • their role is communicated to firms	• it is the only intervention • do not identify business benefits • performed by unknown parties • their role/benefits are unclear	Environment-driven Advantage-driven
Business advice and help lines	• provided by existing/trusted parties • addresses specific needs of firms • relevant service is easy to find • focused on short-term benefits • availability is widely promoted • providers target firms proactively • providers are coordinated • advice services are free	• it is the only intervention • does not address specific needs • provided by unknown parties • relevant service is hard to find • firms not aware of existence • firms expected to seek advice • too many providers of advice • advice is too general/generic	Environment-driven Advantage-driven *It is challenging but possible to provide business advice for:* Compliance-driven Profit-driven

Table 12: A mixed intervention framework to engage all SMEs in environmental improvement (Parker et al. 2009, p.16).

REFERENCES

Albareda, L. et al., 2008. The changing role of governments in corporate social responsibility: drivers and responses. *Business Ethics: A European Review*, 17(4), pp.347–363. Available at: http://doi.wiley.com/10.1111/j.1467-8608.2008.00539.x.

Arnold, M., 2007. Organizational Learning to Manage Sustainable Development. *Business Strategy and the Environment*, 353(April), pp.339–353.

Besser, T.L., 2012. The consequences of social responsibility for small business owners in small towns. *Business Ethics: A European Review*, 21(2), pp.129–139. Available at: http://doi.wiley.com/10.1111/j.1467-8608.2011.01649.x [Accessed July 15, 2012].

Blundel, R., Spence, Laura J & Zerbinati, S., 2008. From CSR to ESR ?: Exploring the entrepreneurial di- mensions of corporate social responsibility. *Open Research Online*, (7), p.23.

Clarke, S. & Roome, N., 1999. Sustainable business: learning - action networks as organizational assets. *Business Strategy and the Environment*, 8(5), pp.296–310. Available at: http://doi.wiley.com/10.1002/(SICI)1099-0836(199909/10)8:5<296::AID-BSE212>3.0.CO;2-N.

Crocker, R.E., 2012. SME Perceptions of Low Carbon Options : Drivers , Barriers and Business Sector Differences. *Earth & E-nvironment*, (7), pp.232–259.

Federation of Small Businesses, 2007. *Federation of Small Businesses Social and Environmental Responsibility and the Small Business Owner*,

Figge, F. et al., 2002. The Sustainability Balanced Scorecard - linking sustainability management to business strategy. *Business Strategy and the Environment*, 11(5), pp.269–284. Available at: http://doi.wiley.com/10.1002/bse.339 [Accessed July 15, 2012].

Fournier, V. & Grey, C., 2000. At the Critical Moment: Conditions and Prospects for Critical Management Studies. *Human Relations*, (53), pp.7–32.

Friedlander, M., 2010. *Implementing Environmentally Sustainable Practices at Small and Medium Enterprises*.

Hansen, E.G., Sextl, M. & Reichwald, R., 2010. Managing Strategic Alliances Through a Community-Enabled Balanced Scorecard: the Case of Merck Ltd, Thailand. *Business Strategy and the Environment*, 399(July), pp.387–399.

Hart, S.L., 1995. A Natural-Resource-Based View of the Firm. *Academy of Management Review*, 20(4), pp.986 – 1014. Available at: http://www.jstor.org/stable/258963?origin=crossref.

Howarth, R. & Fredericks, J., 2011. Sustainable SME Practice; A Reflection on Supply-Chain Environmental Management Intervention. , (January), pp.1–17.

Jenkins, H., 2006. Small Business Champions for Corporate Social Responsibility. *Journal of Business Ethics*, 67(3), pp.241–256. Available at: http://www.springerlink.com/index/10.1007/s10551-006-9182-6 [Accessed July 19, 2011].

Kaplan, R.S. & Norton, D.P., 1996. *The Balanced Scorecard*, Boston: Harvard Business School Publication Corp.

Kechiche, A. & Soparnot, R., 2012. CSR within SMEs: Literature Review. *International Business Research*, 5(7), pp.97–104. Available at: http://www.ccsenet.org/journal/index.php/ibr/article/view/18343 [Accessed July 15, 2012].

Klewitz, J., Zeyen, A. & Hansen, E.G., 2012. Intermediaries driving eco-innovation in SMEs : A qualitative investigation. *European Journal of Innovation Management.*, pp.1–29.

Loucks, E.S., Martens, M.L. & Cho, C.H., 2010. Engaging small- and medium-sized businesses in sustainability. *Sustainability Accounting, Management and Policy Journal*, 1(2), pp.178–200. Available at: http://www.emeraldinsight.com/10.1108/20408021011089239 [Accessed July 15, 2012].

Moore, G. & Spence, L., 2006. Editorial: Responsibility and Small Business. *Journal of Business Ethics*, 67(3), pp.219–226. Available at: http://www.springerlink.com/index/10.1007/s10551-006-9180-8 [Accessed September 13, 2011].

Morsing, M., 2006. Drivers of Corporate Social Responsibility in SMEs.

Natarajan, G.S. & Wyrick, D.A., 2011. Framework for Implementing Sustainable Practices in SMEs in the United States. In *Proceedings of the World Congress on Engineering*. p. 5.

Newell, C.J. & Moore, W.B., 2010. Creating Small Business Sustainability Awareness. *Journal of Business and Management*, 5(9), pp.19–26. Available at: http://journal.ccsenet.org/index.php/ijbm/article/viewFile/7303/5673.

Nidumolu, R., Prahalad, C.K. & Rangaswami, M.R., 2009. Why Sustainability Is Now the Key Driver of Innovation. *Harvard Business Review*, (September), pp.57–64.

Parker, C.M., Redmond, J. & Simpson, M., 2009. Intervention strategies to engage small and medium enterprises in environmental protection. *Environment and Planning C: Government and Policy*, 27(2), p.22.

Pawson, R. & Tilley, N., 1997. *Realsitic Evaluation*, London: Sage.

Revell, A., 2003. The Ecological Modernisation of Small Firms in the UK Presented to the Business Strategy and Environment Conference. *Sustainable Development*, (37).

Revell, A. & Blackburn, R., 2007. The business case for sustainability? An examination of small firms in the UK's construction and restaurant sectors. *Business Strategy and the Environment*, 420(October 2005), pp.404–420.

Revell, A., Stokes, D. & Chen, H., 2008. Small Businesses And The Environment : Turning Over A New Leaf? , (September).

Seidel, M. et al., 2008. A Systems Modeling Approach to Support Environmentally Sustainable Business Development in Manufacturing SMEs. *World Academy of Science, Engineering and Technology*, (48), pp.121–129.

Spence, L J & Rutherfoord, R., 2001. Social Responsibility, profit maximisation and the small firm owner-manager. *Small Business and Enterprise Development*, 8(2), pp.126–139.

Thyil, V. & Wise, V., 2010. Transition to a low carbon footprint : a conceptual model of impacts and management for Australian businesses. In *FSAM 2010 : Proceedings of the International Federation of Scholarly Associations of Management World Congress : Justice and Sustainability in the Global Economy*. Paris, pp. 1–12.

Torugsa, N.A., O'Donohue, W. & Hecker, R., 2011. Capabilities, Proactive CSR and Financial Performance in SMEs: Empirical Evidence from an Australian Manufacturing Industry Sector. *Journal of Business Ethics*. Available at: http://www.springerlink.com/index/10.1007/s10551-011-1141-1 [Accessed July 15, 2012].

Welford, R., 1995. *Environmental Strategy and Sustainable Development*, London: Routledge.

Young, G., 2010. *Opportunities and challenges related to SME implementation of EMSs*, Sydney.