ASHRIDGE

EABIS
European Academy of Business in Society

Creating value from the shift to a low carbon economy

SHORTLISTED ENTRIES FROM

THE ASHRIDGE SUSTAINABLE INNOVATION AWARD 2009

IN ASSOCIATION WITH EABIS AND SUPPORTED BY HP AND WWF

Contents

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Introduction

by Kai Peters, CEO, Ashridge

Since 1999, Ashridge has been challenging MBA candidates and other students of management to consider the changing role of business in society. The Ashridge Award was established to further debate about questions of responsible and sustainable business practice, and to do so in a way accessible to a wide audience, particularly to business leaders and public policymakers.

Coinciding with its 50th anniversary as a business school in 2009, Ashridge is delighted to engage with partners HP and WWF, which are currently collaborating across Europe, the Middle East and Africa, to investigate how innovative use of ICT solutions can help reduce CO2 emissions across different parts of the economy.

The 2009 Award has also taken innovation as its theme. A key part of forming a low-carbon economy will be to find new, innovative and efficient ways of meeting all our needs in the future. The move to a low-carbon economy will require major changes to the way we live and work.

In the transition to a low-carbon economy, companies that innovate to produce climate-smart innovations and transform themselves through new ways of conducting business will thrive, while others will find their market share reduced. The submissions address this theme and present ideas about smarter and more efficient solutions that will allow us to move from manufacturing products to delivering services, and to 'dematerialise' our economy.

We created this award to raise awareness about the relevance of these issues in mainstream management education. As recent research by Ashridge and the European Academy of Business in Society (EABIS) has shown, today's business leaders believe that integrating discussion, debate and reflection about these issues into the learning experience of future business leaders is a priority.[1] It is for that reason that we are pleased to be linking up again with EABIS – an alliance of 100 companies, business schools and academic institutions committed to integrating business and sustainability issues into the heart of management education in Europe.

We were pleased to receive a strong collection of submissions from MBA and other post-graduate management students at business schools across Europe, the Middle East and Africa. The shortlisted submissions are collected in this publication.

As ever, we are indebted to our panel of independent judges, who have devoted their time and effort to selecting a winner (who will receive €7,000 and a six-month mentorship with HP), a runner up (who will receive €5,000) and a third-prize winner (€3,000). All three winners will also receive career advice from Spencer Stuart. It was a privilege to serve on the judging panel and my thanks go to my fellow judges:

- Sir Paul Judge, Benefactor of the Judge Institute, Cambridge University
- Eric Cornuel, Director General, EFMD
- Jeanette Purcell, Chief Executive, Association of MBAs
- Gabriele Zedlmayer, Vice President Corporate Marketing and Global Citizenship, HP EMEA
- Dennis Pamlin, Global Policy Advisor, WWF
- Della Bradshaw, Executive Education Editor, *Financial Times*
- Tom Dodd, CSR Policy Advisor, DG Enterprise and Industry, European Commission
- Anthony J Vardy, Senior Director, Spencer Stuart & Associates
- Rachel Jackson, Head of Social and Environmental Issues, Association of Chartered Certified Accountants
- Viscount Etienne Davignon, Chair, European Academy of Business in Society and Vice-Chair, Suez-Tractebel.

Finally, we are also indebted to all the MBA and other management students who submitted entries to this year's competition. Their efforts demonstrate the very high quality of thinking that is pushing forward the debate around the role of innovation in our shift to a low-carbon economy.

1. Gitsham et al., *Developing the Global Leader of Tomorrow*, Ashridge and EABIS, 2009. <http://www.ashridge.org.uk/globalleaders>.

Foreword from EABIS

by Professor Gilbert Lenssen, President EABIS and David Bevan, Academic Director

EABIS is pleased join forces once again with Ashridge for the Ashridge Sustainable Innovation Award 2009. This year, we were delighted to be joined not only by EABIS corporate member HP but also by WWF, which contributed invaluable support, experience and insights. Focusing on sustainable innovation, the award gives MBA students from EABIS member-institutions and beyond an excellent platform to increase their understanding of a rapidly changing, challenging and challenged business environment. Students who are able to address, in an innovative way, the strategic issues that climate challenge presents to business are most likely to be those who will play a role as the next generation of business managers and leaders.

Two key themes of the 2009 award are innovation and creativity, and we are delighted that this award was chosen to feature among the selected projects of the European Year for Creativity and Innovation. We also feel that the very consortium of partners to this project itself reflects these two key themes in action: Ashridge, EABIS, HP and WWF. One of the world's leading business schools; a not-for-profit organisation unique in its membership, aiming to integrate sustainability into the mainstream of business theory and practice; one of the world's largest IT companies; and one of the world's most experienced independent conservation organisations.

The Ashridge Sustainable Innovation Award recognises MBA students as critically important drivers of change. Against a complex backdrop of political, social and environmental pressures linked to globalisation, and the European Commission's stated objective of transforming Europe into a knowledge society, companies are recognising the need for a new profile of managers and leaders. This calls for management students to be equipped with a broader set of skills enabling them to manage ethically, sustainably and profitably, going far beyond the traditional, often narrow maximisation of shareholder value. Encouraging MBAs to reflect on these macro issues is a crucial way of increasing awareness and supporting long-term change.

EABIS is therefore delighted to collaborate with Ashridge, HP and WWF on this Award. We would like to acknowledge the outstanding level of contribution from all this year's entrants, and hope that their thought leadership is a true indicator of progress in the MBA community in the context of knowledge development for a new sustainable economy.

Foreword from HP

by Gabriele Zedlmayer, Vice President Corporate Marketing and Global Citizenship, HP Europe, Middle East and Africa

HP is delighted to sponsor the Ashridge Sustainable Innovation Award 2009. We are keen to support this award because we believe it is very important for MBA students and postgraduates not just to think about the sustainability challenges that await them when they enter their professions, but also to recognise the opportunities that they have to contribute actively to a low-carbon economy.

Since the launch of this award in autumn 2008, we have seen tremendous changes around the globe. Every day it becomes more evident that we cannot continue business as usual. We need to take action today to respond to these changes, and HP believes that smart, sustainable innovation plays a crucial part in this respect.

Sustainability has, for a long time, been a key aspect of how we run our business. For decades, we have been looking at ways of reducing the carbon footprint of both our operations and our products so that we, in turn, can help our customers do the same.

We have also been looking at new solutions and the potential of IT in reducing greenhouse gases in sectors that can have a much larger impact on society. An obvious example is video conferencing, where IT helps to reduce carbon dioxide emissions generated by frequent travel.

But it does not stop there. IT can also significantly reduce emissions in other areas, such as smart buildings, smart commerce, industrial production, and dematerialisation services. HP has been working with WWF, a strong partner which is also supporting the Ashridge Sustainable Innovation Award, to look at the potential savings in these areas in a number of different ways. In a joint project called 'ICT Innovation as a Driver of Climate Change Solutions', HP and WWF have published a selection of reports that focus on IT as a driver for a low-carbon economy.

We are delighted that the debate on sustainable innovation has been taken to the academic world through the essay award and through a series of workshops delivered by Dennis Pamlin, Global Policy Advisor at WWF. The workshops took place at key partner universities of HP and EABIS in the Czech Republic, Egypt, France, Germany, Hungary, Poland, Switzerland, Turkey and the United Kingdom, and were a great success.

I would like to thank all the students for their inspiring contributions to the competition and I hope you will enjoy reading the diverse essays compiled in this publication. Special thanks also go to the judges for reviewing the essays and to Dennis Pamlin, the universities and business schools for hosting the workshops.

This unique project has successfully brought together leading organisations from academia, the non-profit sector and the business world to address climate change as one of the most burning issues of our society. I would like to thank Ashridge, EABIS and WWF for their wonderful partnership and contributions to this important project.

Foreword from WWF

by Dennis Pamlin, Global Policy Advisor, WWF

Throughout history and in one form or another, we have witnessed change. Some people regard change as problematic while others – just a few – regard change as a great opportunity.

Climate change, which sees the need for resource-efficient solutions and a reduction in poverty, as well as the end of relatively cheap oil, is probably the greatest challenge of our generation. Across all industrial sectors, climate change will be a crucial part of the executive agenda. A new generation of business leaders capable of identifying business opportunities is urgently needed. In order for us to meet this great challenge head-on, we need the most ambitious and innovative people to focus on finding solutions from an opportunity perspective.

This is the purpose of the Ashridge Sustainable Innovation Award in association with the European Academy of Business in Society and supported by HP and WWF. This joint project has brought together HP, a world-leading innovative company; EABIS, a unique alliance of companies, business schools and academic institutions; Ashridge, one of the world's leading business schools; and WWF, a world-leading environmental NGO.

One of my objectives within this project was to visit various academic institutions in Europe, the Middle East and Africa (EMEA), to meet with students and interested faculty members. The usual set-up of my tour was a lecture followed by a workshop, during which innovative low-carbon ideas were explored in depth. In many cases the discussion focused on threshold events – such as the launch of a ground-breaking technology, a stock market crash or the election of a new government – that can open up opportunities for solutions that would have been impossible before and that could trigger more transformative changes in society. Discussions from the workshops revealed that much of the existing literature that students have as part of their curriculum has been written without sufficient knowledge about how to do business on a planet with ecological limits. It was very encouraging to see that many students already have very interesting ideas that they have begun to develop, either independently or with support from teachers. This kind of innovative and proactive thinking is exactly what the award is all about.

The workshops covered a broad range of topics, from implementation plans for multifunctional irrigation and energy systems in Egypt to business models built on real-time visualisation of global trends in the UK. We still live in a society that focuses more on words than on action. We need a new generation of entrepreneurs who can create initiatives that will bring leading stakeholders together and allow a platform for concrete projects to be developed. Judging from the feedback received from the workshops, the need is significant. I am, however, optimistic that the next generation of business leaders will be willing and able to embrace the need for a shift to low-carbon development. I hope this tour will be followed by many more initiatives.

Seldom has the world been in such dire need of business innovation and leadership. My hope is that some of the people I have met during this project will turn into winners in a low-carbon economy and that their ideas will provide the economic literature for future generations. Our future needs those who can look at the world in a new way and create the right solutions for the 21st century. I hope that this project has helped support some future business leaders who will contribute to concrete results.

The Winning and Shortlisted Essays

FIRST PLACE

How Can Organisations Innovate to Create Value from the Shift to a Low-carbon Economy?
Jonathan Alexander, University of Bath, UK

SECOND PLACE

The British Network of Charity Shops as a 'Green' Distribution Channel
Luc Petit, Ashridge Business School, UK

THIRD PLACE

Enabling Organizations and Individuals to Reduce Carbon Emissions using Mobile Positioning
Srikanth Madani, University of St Gallen, Switzerland

ALSO SHORTLISTED

Algapower: Shifting to a Low-carbon Economy by Producing Algae-based Biofuel
Doreen Bunke, Didier Engels, Jana Mancevova, Björn Wenzlaff, ESSEC & Mannheim Business School, Germany

Never Ending Race
Ian Stevens, University of Portsmouth, UK

The Strategic Window of Sustainability
Tom Moore, University of Warwick, UK

How Can Organisations Innovate to Create Value from the Shift to a Low-carbon Economy?

by Jonathan Alexander, University of Bath, UK

In two very different parts of the world today, two very different innovation programmes are under way in the same industry.

In Detroit, spiritual home of the American motor industry, the game is on to bring the first commercially viable electric cars to market. In March, Barack Obama announced a $2.4 billion incentive plan during a tour of an electric car plant in California, with the aim of getting one million plug-in hybrids on the road by 2015. It is a major part of the administration's plan to boost a green economic recovery in the USA, and it certainly sounds exciting.

But there are two big problems. First, there is some serious reticence in the industry. Brett Smith, of the Centre for Automotive Research in Michigan, is one voice questioning the plan, saying: 'The economics won't make sense for the majority of Americans in the next several years'. Over a month later, no major manufacturer had indicated a willingness to take on a programme of the scale that would meet Obama's targets. Tony Posawatz, line director for GM's hybrid prototype, the Volt, seemed to speak for the industry when he said diplomatically: 'It's not readily obvious, based on the product plans that have been communicated, that the 2015 objective aligns with what's currently on the cards'.[1]

The second problem is the polar opposite: even if achieved, is this plan really commensurate with the scale of the problem? There were an estimated 250,851,833 registered vehicles on the roads of America in 2006;[2] if this number were to remain the same, or even decline by as much as 20% in the nine years to 2015, the one million hybrids would still represent fewer than 0.5% of the total number of American vehicles. The remaining 99.5% are not exactly world leaders in efficiency: at present, the average American car does less than 20 miles per gallon, and America's cars account for half the carbon emissions from all the world's cars put together.[3] Remember, the stimulus plan is not even for full electric cars, but hybrids, the current prototypes of which revert to conventional fuel after approximately 40 miles.

Let us turn to the second innovation stream in the motor industry. Nearly 8,000 miles from Michigan, Muhammad Yunus is getting involved. The man who founded the Nobel Prize-winning Grameen Bank has gone on to establish more than 30 companies in his home country. His latest project, as he announced at the inaugural lecture for the Ashden Awards for Sustainable Energy,[4] sees him challenging Volkswagen to deliver an affordable vehicle for the Bangladeshi masses, much like the renowned Tata project. The difference is that Yunus has demanded the engine in this car be entirely pollution-free; and that it should be easily removable in order to power an irrigation pump, or a household generator, when not in use. Volkswagen, so he says, have leapt at the challenge.

There are three significant contextual differences between the two situations, which explain why Yunus is able to do what Obama does not seem capable of achieving. Each of these leads us to a new rule of thumb for the kind of innovation we need to enable the creation of solutions that are genuinely commensurate with the scale of the challenges we face. Using examples, I will show that these rules are not radical fantasies, but merely serve to formalise what is already being proved to work by the most exciting organisations and individuals pursuing their work in the world today.

1. <http://www.nbcsandiego.com/news/green/NATLPlug-in-Hybrid-Cars-by-2015-No-Way-Mr-President.html>.

2. <http://en.wikipedia.org/wiki/Passenger_vehicles_in_the_United_States>.

3. <http://www.guardian.co.uk/environment/2006/jun/29/travelandtransport.usnews>.

4. <http://it.truveo.com/Muhammad-Yunus-Ashden-Awards-lecture-2009-intro/id/1695493681>.

DIFFERENCE #1: THE EXISTING INFRASTRUCTURE IN THE NATIONAL INDUSTRY.

According to the UN's World Statistics Pocketbook, Bangladesh has two cars per 1,000 people to the USA's 765.[5]

Rule #1: Start from scratch

There are certainly challenges and obstacles blocking the path of innovation in the global south, but there can be little doubt that the relative absence of powerful industry lobby groups and vested interests helps visionaries such as Yunus. So what we can we learn from this? Arguably, that we must act as if from scratch. This is a time for invention, not just innovation. And as such, it may well be a time of excitement and opportunity unprecedented in living memory.

Yunus' practical example is backed up by the work of Venezuelan economist Carlota Perez, who highlights the nature of economic cycles, showing that crashes and periods of turmoil seem in fact to be necessary phases to enable the potential of new technologies and infrastructure to be fully realised. On Perez's analysis, the Great Depression was a key facilitator of economic and welfare reform across the world, and as great a factor as the Second World War in the creation in the UK of the welfare state and the NHS, as well as in the USA of the New Deal and the GI Bill of Rights. As a recent lead article in Prospect magazine concludes, the key implication of Perez's work is that 'some of the old has to be swept away before the new can find its most successful forms. Propping up failing industries is in this light a risky policy'.[6]

One vital area where we are just beginning to see the power of 'starting from scratch' in the UK is the energy industry, where a ten-year-old company called Good Energy is proving a disruptive influence in the UK energy market. Although still very small, it is growing rapidly, and its managers' ability to think from scratch about what an energy company should be doing, as opposed to trying to evolve from the huge vested interests of one of the UK 'Big Six', has been a big part of this.

To pick a specific example, consider Good Energy's innovative feed-in tariff schemes. For several years, their HomeGen scheme has been paying people with domestic solar panels and wind turbines 15p for every unit of energy they generate, even the ones they use themselves – and it started doing this when paying one's customers at all was a total inversion of the established model. This year, the company has extended this into solar heating with the new HotROCs scheme. No one else in the European market is doing anywhere near as much to encourage decentralised power generation.

This is not quite as impressive as what has been achieved by Grameen Shakti, Yunus' energy company. According to this company's latest data,[7] it has installed 220,000 domestic solar power systems in locations across Bangladesh, with total beneficiaries numbering more than two million, in a little over ten years; the vast majority of its impact has been achieved in the last five years. Like all Grameen companies, Shakti is owned by its customers, and operates without shareholder dividend. All money generated goes back into the company to enable it to continue its work – whether by expanding, or by reducing prices to make products accessible to an even greater proportion of the population.

Good Energy may not quite have started from scratch in the way that the Grameen companies have, but its example shows what is possible when you are brave enough to throw out the established wisdom of the industry.

DIFFERENCE #2: THE GENRE OF VALUE SOUGHT IN THE INNOVATION PROCESS.

Yunus is seeking the greatest possible public good; the American industry, by the legal terms of incorporation, seeks financial shareholder returns as the ultimate end.

Rule #2: See financial value as the means, not the end.

Yunus' first foray into the world of business was the Nobel Prize-winning Grameen Bank, the organisation that made microfinance famous. It all began when Yunus, then an economics professor at the University of Chittagong, went to visit the poor households in the nearby village of Jobra. He soon discovered that the main thing that was holding the people of Jobra back was the usurious lending of apparently trivial amounts of money. He found that loans totalling $27 had effectively enslaved 42 people in Jobra.

What a lesson this was for an economics professor! Here I was teaching my students about our country's Five-Year Development Plan with its impressive goal of investing billions of dollars to help the poor. The gap between the promised billions and the pitiful sum that a few starving people actually needed seemed incredible. [8]

5. <http://www.nationmaster.com/graph/tra_mot_veh-transportation-motor-vehicles>.

6. <http://www.prospect-magazine.co.uk/article_details.php?id=10680>.

7. <http://www.gshakti.org/glance.html>.

8. Yunus (2007), *Creating a World without Poverty*, p46.

So the Grameen Bank began when Yunus decided to lend these 42 people the $27 they needed from his own pocket. And he was paid back, at a level of interest that meant he could lend to more people, and his recipients could afford to pay, and start to work their way out of poverty. He had the impact he wanted to have; the financial return he got served the purpose of allowing him to do even more.

The lesson here is that financial value is useful. It is necessary. It is powerful. But it must not be the ultimate objective. This is something that is almost impossible to say out loud in the world today. Our governments chase GDP in almost as great a fever as our companies chase shareholder value, and we all refuse to recognise that it is only when we focus on the ends we really want to achieve, and use financial value as a servant to help us do it, that we will succeed.

There can be no more pressing case for this than the transition to a low-carbon economy. We must recognise that if creating financial value is allowed to become the overriding goal of that transition, as even the question for this essay competition implies, we will not succeed. There will always be quicker ways to turn a buck than the low-carbon way. Although the financial value generated in the short term may be smaller, just like Yunus' first loan compared with Bangladesh's Five-Year Plan, it will be sustainable and sustained: just like Grameen Bank.

Fortunately, aiming at financial value has never, and will never, inspire true innovation. This makes intuitive sense. When you are aiming for financial value, you must work incrementally, because you must develop something you can prove will work. You must therefore be able to base your assumptions on reliable parallels. This results in what I call Gillette Innovation – the addition of another blade to the 73-blade razor – and the managed innovation that takes place in major corporations, and that is conducted with the express purpose of deriving financial value, is almost always of this sort.

Indeed, the finest examples of innovation in recent years serve as further proof of the point. Google, for example, came out of the experimenting of two self-confessed 'geeks' into what they could do with the Internet. As a result, these entrepreneurs continue to recognise the need for (relatively) unmanaged innovation, allowing Google engineers to retain 20% of their time for pursuing their own projects, with no initial pressure to show financial return.[9]

This is the circumstance of true innovation; the space to think, to anticipate and understand a 'market' intuitively, rather than modelling it financially. And our capacity for true innovation is precisely why we have a chance of making the transition to a low-carbon economy. True innovators are capable of understanding that the switch to a low-carbon economy is the prerequisite for the creation of financial value in the future, not the other way around. True innovators will – as they always have – create what is needed, not what will make money. And true innovators will then, and only then, work out how to create the financial value that will make their innovation viable.

DIFFERENCE #3: THE GENRE OF 'NEED' RESPONDED TO IN THE INNOVATION PROCESS.

Yunus is responding to a fundamental need; American industry has its perception of need blurred by consumer desire.

Rule #3: Satisfy needs – not wants

True innovators will create what is needed. So what does 'need' mean? I find the Chilean economist Manfred Max-Neef's work[10] very useful in this context. His key insight is to separate the concepts of 'need' and 'satisfier', so we do not, for example, have a need for food; we have a need for subsistence, which is fulfilled by food. We do not have a need for a home to live in; we have a need for protection, which is fulfilled by the home.

Under Max-Neef's definition, there are nine fundamental human needs: subsistence, protection, affection, understanding, participation, idleness, creation, identity and freedom. Further, he divides the satisfiers that we use to fulfil these into five genres, according to their effectiveness. Two of these are particularly important in this context.

- Pseudo-satisfiers give the impression of satisfying a given need while undermining it in the medium to long term. In much of the developed world today, the world of branding seeks to associate products with values that the purchaser then incorporates in an attempt to satisfy the need for Identity; only now are we beginning to realise how false this is.

- Synergic satisfiers satisfy many needs in one. Growing one's own food, for example, may be aimed at satisfying the need for subsistence, but will also provide participation, creation, and identity.

My contention here is that true innovation should start with needs, not desires; and further, that it should aim to create synergic satisfiers, and avoid pseudo-satisfaction at all costs. Any innovation that creates synergic satisfiers will automatically be low-carbon innovation; no synergic satisfiers will be able to undermine the fulfilment of our need for subsistence, which means no infringement of the health of the planet.

Returning to the original example, it is clear that the American automotive industry is clogged with pseudo-satisfiers. Over the years, advertising campaigns have

9. <http://www.nytimes.com/2007/10/21/jobs/21pre.html>.

10. Max-Neef (1991), *Human Scale Development* (Apex Press).

created a role for the personal vehicle as a pseudo-satisfier of identity, freedom and protection. But material goods can never truly satisfy the need for identity, and as they become bigger, faster, and more gas-guzzling, they actually undermine our capacity to fulfil our needs for both freedom and protection to an ever-increasing degree.

Yunus' plan with Volkswagen, on the other hand, is in the role of synergic satisfier. A pollution-free engine in the role of generator will help the satisfaction of the need for subsistence; at the same time, the vehicle will indeed help satisfy the need for freedom, and increase opportunities for creation and participation. With no pollution, there will no long-term threat to our need for protection; and no carbon.

Could every new product, service, or business be designed with the principle of synergic satisfaction of fundamental needs in mind? There seems no reason why not.

Indeed, to see the world with these eyes is to see a world of opportunity, particularly in the markets of the global north. This is precisely because so many of our needs are currently pseudo-satisfied. Take the fundamental need for identity, for a sense of self in relation to the world, for example. At present, almost all of the efforts that we, in countries such as the UK and USA, make to fulfil this need are expended on pseudo-satisfiers – brands such as Coca Cola or Diesel jeans tell us that they stand for optimism and happiness, and by purchasing them, we at some level hope to assimilate these values into our own identity.

This reliance on material goods to satisfy fundamental needs generates huge quantities of unnecessary carbon emissions; emissions which are totally unjustifiable, since the need remains unsatisfied regardless. So how else could the need for identity be satisfied? What would a synergic satisfaction of this need look like?

London's School of Life[11] represents one example of an answer. By offering truly adult education, in the form of courses about 'Love, Politics, Work, Play, and Family', they help their students to develop their relationship with the world around, and therefore their identity. This process, undertaken in a course group, also fulfils the need for participation and for understanding, as people work through the process together; and the course structure is built around unleashing the creativity of the participants, so the need for creation is also satisfied.

By facilitating the development of identity from within, rather than relying on external factors such as material possessions, the School of Life is an example of truly low-carbon innovation. The School's ambitious growth plans suggest it is working.

This is all very well, but at present it does feel as if there is an opportunity for the ethical entrepreneur, rather than the mainstream. This cannot be the case for much longer, given the timescales we face. We need corporations to embrace these ways of thinking, and fast. So how might this happen?

The fundamental starting point must be a redefinition of the meaning of value. While financial value and, particularly, short-term shareholder returns remain king, we have little chance of breaking out of our current destructive cycle. The growth of ethical investment and the current success of organisations such as the Co-operative Group in the UK suggest that people increasingly what to know what their money is doing, not just that it is growing. Is it so radical to imagine an end, if not to shareholder ownership, then at least to distanced shareholder ownership, where only financial returns are measured? If every shareholder were responsible for the actions of the company in which his or her money were invested, would we not see a drastic change in behaviour very rapidly?

With the economic downturn, we in the UK have been forced to take the first steps on this path with such actions as the nationalisation of Northern Rock and massive government help for other banks. We must now embrace the opportunity this represents, and reinvent the context for innovation. When this is set up appropriately, we will see a proliferation of ideas like Good Energy, like the School of Life, and if we are lucky, like those of Muhammad Yunus. When that happens, we will have a low-carbon economy.

To return to the comparison with which I began this essay, between Bangladesh and the USA, I want to finish by leaving you with a question to consider. Which of those two innovation streams would you most like to be part of? To my mind, it is a pretty easy decision. The fact is that the kind of innovation I have laid out here, the kind that will truly lead to a low-carbon economy, is not just the one that is necessary to create a sustainable future. It is also the most fun to be involved in. If that combination isn't about creating value, I don't know what is.

11. <http://www.theschooloflife.com>.

The British Network of Charity Shops as a 'Green' Distribution Channel

by Luc Petit, Ashridge Business School, UK

1. EXECUTIVE SUMMARY

Globalised and industrialised, the British food market has a large environmental impact. By suppressing distances and seasons, it has encouraged greenhouse growing, international shipping and over-packaging. Organic initiatives have improved production methods but logistics affect overheads. Organic labels alone do not guarantee low-carbon footprints.

In that context, and to follow the success of organic labels, a 'fully green' offer has to be encouraged. To reduce shipping and packaging, a logical answer would be to reorganise a segment of local products. It would respond to the demand of some customers for environmentally friendly goods and fill a gap in the British market.

From a business perspective, a national brand could launch these products and target this market. Nevertheless, the setting-up would be slow and uncertain, as the networks of local producers would have to be organised from scratch.

Thus, this paper proposes a business synergy for charity shops. As these not-for-profit organisations have a successful network of stores, local volunteers and ethical customers, they could start this business quickly and develop it progressively. The synergy between social and environmental activities would reinforce their community, strengthen their market positioning and provide new incomes for their parent charity.

To be implemented, this proposal has to be customised appropriately. Some possible scenarios are:

- to integrate sale of local food with existing activities, as Oxfam does with fair-trade products
- to create dedicated shops affiliated to environmental charities, such as the Soil Association, FWAG or WWF
- to use green trade as a springboard for the 'reinsertion' of certain disadvantaged groups into the working community, taking the example of the Prince's Trust.

In conclusion, trading of local products is an environmental necessity and a significant business opportunity. By backing it, British charities could reinforce their strategies and create value from the shift to a low-carbon economy.

2. INTRODUCTION

Climate change is currently forcing society to rethink its economic model. Believing that it represents a significant business opportunity, the 'Sustainable Innovation Award' invites MBA and other postgraduate students to submit their best ideas about how organisations can innovate to create value from the shift to a low-carbon economy.

Focusing on business innovation, this paper reflects on 'how to create value through developing new organisations, new business models and new markets that assist the shift to a low-carbon economy', in the particular case of the British food market.

The discussion will first consider local food, its definition and its environmental value. Afterwards, the paper will look at the market potential of such products in the UK. Then, once the limits of classic business models have been exposed, an innovative proposal for using the network of charity shops will be explained. Its implementation will be detailed by considering different strategic scenarios.

To clarify and strengthen the argument, the town of Chesham (Buckinghamshire, England) will be used as a case study.

3. LOCAL FOOD: SUSTAINABLE INTEREST AND DEFINITION

'In 1961, the footprint of all goods and services traded between nations was as much as 8 per cent of humanity's total Ecological Footprint. By 2005, this had risen to more than 40 per cent.' (WWF Living Planet Report 2008).

Following this trend, the British market for consumer goods has also progressively amplified its environmental impact. The retail market has become more centralised, globalised and industrialised. As a consequence, and

following the rise in demand, the impacts of production, packaging, transport, refrigerating and end-life treatment have dramatically increased.

Considering the food industry, Patrick Holden (Soil Association director) said that 'although it is not widely realised, agriculture and food distribution contribute the largest single share of carbon emissions, so reducing this carbon footprint must be seen as a number one priority'.

Unfortunately, this priority is unsung and the market often confusing.

In the public mind, reducing carbon emissions will come mainly from greater use of organic produce and recycling. Unaware of logistical aspects, many customers incorrectly consider that organic products with biodegradable packages are fully sustainable. In fact, greenhouse growing, packaging, refrigeration and transport can easily neutralise the benefits of organic production. Even if positive, organic labels alone do not guarantee low-carbon footprints. Complementary local purchasing should be encouraged to reduce logistical impacts.

To develop this idea, the discussion here will focus on the concept of 'local food'. It is generally defined as a product grown and manufactured in an area close to where it will be consumed, is seasonal, and whose production takes account of local natural constraints. Refrigerating, warehousing, packaging and transport must be extremely limited. Organic production is favoured but not mandatory.

To be consistent, local food has to respect its natural and historical environment. To avoid the paradox of winter organic tomatoes, the offer must reconcile customer demand with seasonal and regional bio-capacity.

Case study: Chesham (1/5)
Chesham (Buckinghamshire, England) is a town of 20,000 people situated 25 miles north-west of central London. It is a wealthy area with retail facilities and average incomes of £62,075 a year in 2007.[1]

Below is the commercial offer for six basic fruits and vegetables. This listing was done in the main supermarket (Sainsbury's) on 24 April 2009.

ORIGIN OF ORGANIC VEGETABLES	
Product	**Origin**
Apples	USA
Pears	Agentina
Carrots	Israel
Potatoes	Israel
Mushrooms	England
Cucumbers	Bulgaria

In this selection and in the rest of this department, the only British organic vegetables were the mushrooms. All the other organic products came from distant countries. Some non-organic English products were also available but without any mention of their region of origin.

What would you choose between standard English apples or organic American apples?

Which ones have the lowest ecological footprint?

4. MARKET POTENTIAL FOR LOCAL FOOD

As explained in the last section, long-distance shipping reduces the environmental gain from organic production. Centralised and globalised trading has created the paradox of organic products with high carbon footprints.

Considering that 60% of the food consumed in the UK is still produced nationally,[2] and that 4% of this production is organic,[3] it is possible to reorganise distribution of a segment of local products, preferably organic ones. It would reduce the impact of shipping by prioritising and stimulating local capacities.

Such a change would result in higher prices (owing to the constraints of local climate, cost of labour and organic methods) but it would provide a coherent sustainable offer.

Knowing that 48% of British people would agree to pay more for environmentally friendly reasons, that 53% are concerned about climate change and that 22% are worried about 'food miles', this market has real potential.[4] A psychographic segmentation (as is done for Fairtrade products) must be developed to reach these customers.

In terms of competition, no company has clearly positioned itself to lead this growing segment (via the Web or a network of shops); there are only start-ups and small, specialised companies. For consumers, 'buying local' is possible but it requires more time and energy, as the offering is split between farms, local shops and large retailers.

Case study: Chesham (2/5)
In the town centre of Chesham, there are currently 130 small shops and two supermarkets (Sainsbury's and Waitrose) for 20,000 people.

International organic foods are available in the supermarkets. Some organic non-perishable products are also sold by a small shop, Healthright, in the high street (along with healthcare products), and fresh local eggs are available at the family butcher.

1. Barclays Premier Banking statistics.

2. Farming and Wildlife Advisory Group, 2009 <http://www.fwag.org.uk>.

3. DEFRA, 2005.

4. GB TGI BMRB, 2006, Q4/mintel.

The following products are not normally available in Chesham:

- local fruits and vegetables
- local meat, cheese and bread
- local specialities (conserves, biscuits, honey, etc.).

Two miles from the town centre, Hazeldene farm sells organic meat and seasonal vegetables.

There are also nearly 30 farms and shops in Buckinghamshire registered for organic food.

How many people know of the existence of sustainable local offers?

How many customers are interested in sustainability but do not make the effort to go to the farms?

5. LIMITS OF CLASSIC BUSINESS MODELS

There is a demand for local products and a lack of competition in this segment. A national retailer (or a network of franchises) could therefore create some specific stores and offer a range of local food, preferably organic. This would target customers with social and environmental predilections.

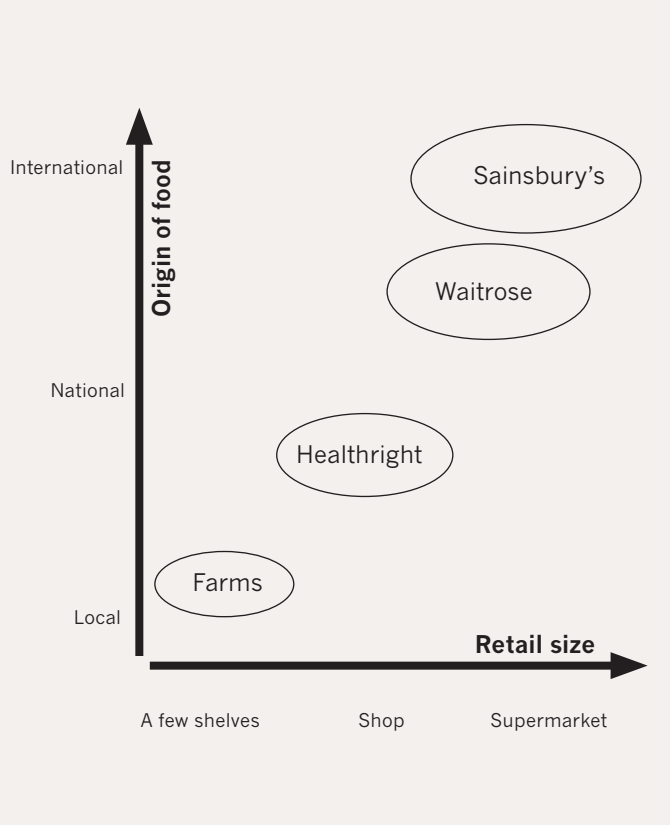
In France, for example, this segment is led by 'Bio coop'. This company of 315 franchises has defined 'local and seasonal supply' as its first priority. With more than 20 years of experience, the shops respond to a wide range of local, seasonal, organic and fair-trade products. They also participate in ecological lobbying. With an income of €160m, they had a net profit of €700k in 2007 (0.44%).

Nonetheless, copying this model in the UK is quite risky, as:

- large retailers have already taken the lead in organic products (even if not local)
- consumption habits are different from those in France and demand for fresh food is lower in the UK
- seasonal and local foods represent a narrower variety of products than in France
- the local networks of organic producers have to be organised.

The fragmentation of business demonstrates the complexity of this sector: a multitude of associations, local shops, neighbourhood initiatives and Web retailers have launched some sustainable offers but no single business can have a great impact on the market equilibrium. Another business model has to be imagined.

Case study: Chesham (3/5)
Here is the market map of organic products in Chesham:



As shown in the graph, the market for organic food is fully controlled by the two supermarkets. Healthright and the farms take marginal shares of the market in national and local products.

How would you position a local food shop in relation to the competition?

How would you source enough products to maintain profitability in this segment?

6. CHARITY SHOPS AS DISTRIBUTION CHANNELS

Large companies with centralised supply would not be suitable for local sourcing. By definition, local products must be traded locally, through small and decentralised systems.

With their network of successful charity shops, some not-for-profit organisations present these characteristics. They have small retail facilities in the high streets (7500 shops in the UK) with strong community support and a large base of local volunteers. Moreover, part of their customer base has ethical predilections and behaviours (charity causes and re-use of goods).

Of course, they have some limitations and constraints but, from a general perspective, they have the right positioning for selling local food. A commercial strategy that would respect the potential of the shops (and of their volunteers) could take advantage of their long experience in retail. By selling local food (some boxes of seasonal vegetables, for example), they could create a stable and reliable distribution channel for local producers. It would stimulate the regional economy and open opportunities to sustainable initiatives.

For parent charities, the benefits could also be significant. First, such a scheme would provide additional income with very limited investment. Secondly, it would differentiate the shops from those of other charities and increase loyalty among customers. Apart from Oxfam, which sells fair trade products, not-for-profit organisations generally compete on exactly the same model (mainly greeting cards and second-hand goods). Lastly, it would reinforce their community base and their image. Charities are already recognised for their contribution in re-use and recycling; they could accentuate this environmental benefit by launching local products.

To implement this business model, each charity shop or parent organisation would have to consider its capability and the local context. A few scenarios will be proposed in the next section.

Case study: Chesham (4/5)
Six charity shops are established in the town centre of Chesham.

CHARITY SHOPS IN CHESHAM		
CHARITY	**CAUSE**	**COMMERCIAL OFFER**
RSPCA	Animals	Cards and second hand goods
Shaw Trust	Disability	Cards and second hand goods
Hospice of St Francis	Palliative care	Cards and second hand goods
Cancer Research	Cancer	Cards and second hand goods
Helen & Douglas House	Hospice care	Cards and second hand goods
Oxfam	Poverty	Fairtrade food, organic cleaning products, cards and second hand goods

Would it be possible to differentiate these commercial offers?

How would you attract more business?

7. SCENARIOS OF IMPLEMENTATION

There is no unique path by which to start local trading: the method and the pace of implementation must be decided in their context.

First, the project owner must be identified before the context can be defined. Four options are imaginable.

1. The project is launched by the Association of Charity Shops as a way of promoting new business opportunities. By defining national know-how, the association would encourage and support the initiatives of its adherents.

2. The project is studied by a national charity to reinforce its organisation. With the objective of increasing its turnover, reinforcing its image or developing its community, the charity would look for a global strategy that would suit its cause and its capability.

3. The project is considered locally, between some charities in the same area. By redefining the positioning of each of them, they could change their spread of activities and improve their overall efficiency. For example, one could leave the selling of second-hand books to the others and replace it with local food.

4. The project is led by a charity shop as an independent initiative. The shop would therefore define the strategy that fits its capabilities and the local market.

Secondly, the project owner must formulate its objectives and define its marketing strategy, considering both the market context and the organisation's capability.

The size of the study will depend on the size of the projected market. If the initiative is local, the customers can influence the marketing strategy through direct feedback. If the project is national, some statistical elements will be needed to determine the potential of different options.

The implementation must take into consideration the technical and managerial aspects of the organisation. What are the legal constraints (health and safety) in fresh food supply? Are the shops big enough to stock the products? Are the volunteers prepared for such activity? What will be the level of inventory? How can the community network be used to create a base of local producers? What would be the additional costs?

Thirdly, and to make it concrete, here are some ideas of products and services that could be proposed:

- sale of boxes of seasonal local fruits and vegetables (available daily or weekly only)

- sale of local breads, cakes, biscuits and seeds

- sale of local eggs, chicken and meat (on request or daily)
- sale of local beers, beverages and fruit juices
- sale of locally manufactured food (flour, chocolate, yogurt, etc.)
- tastings of local specialities, held with producers (jam, honey, cheese, etc.)
- tastings of traditional varieties of fruit and vegetables.

Lastly, to illustrate the implementation, three different scenarios will be described. These options are not exhaustive but represent some potential strategies.

1. Complementary offers

In all its shops, Oxfam offers fair trade products in addition to the traditional second-hand goods. This increases its income and reinforces its strategy for reducing poverty in the world.

In the same spirit, some charities could use local food to reinforce their image and market. Knowing that they are already respected for re-using products and limiting the amounts of waste, they could follow this environmentalist path. By having some 'green shops', the charities could increase their attractiveness to the environmentally minded customers. They could also combine this with addressing their core concerns, such as animal welfare (the RSPCA could sell free-range local food, for example) or healthy lifestyle (Cancer Research or hospices could sell local foods known to be healthy).

2. Specialised groceries

To be more radical, some environmental charities could decide to launch some specialised groceries with a wide range of local and sustainable products. Keeping the charity shop model, the Soil Association, the Farming and Wildlife Advisory Group (FWAG) or the World Wild Fund for Nature (WWF) could decide to motivate volunteers and to open their own stores. They could raise money and advance their ecological agenda at the same time.

If the above suggestions are too ambitious, it is also possible to imagine that some existing charity shops could be divided into two parts. One side would be managed by the current charity and dedicated to classic second-hand goods, while the other side would be managed by an environmental organisation as a mini local grocery.

3. Reinsertion platforms

Taking another approach, a third idea would be to use local groceries as 'reinsertion' platforms. The environmental activity would be a temporary and motivating job for the volunteers. It could supply work for some young people needing reinsertion into the working community (Prince's Trust beneficiaries, for example) or for some recently disabled people needing to adapt to a working environment (Shaw Trust).

By seizing the opportunity to 'do good', both customers and volunteers could benefit from a positive atmosphere and stimulate local food production and consumption.

Case study: Chesham (5/5)

Here is the listing of the charity shops with possible strategies.

CHARITY SHOPS IN CHESHAM		
CHARITY	**<=>**	**POTENTIAL STRATEGY**
RSPCA	?	Specialised grocery
Shaw Trust		Split shop
Hospice of St Francis		Complementary activity
Cancer Research		Reinsertion plateform
Helen & Douglas House	?	.....
Oxfam	<=>	.....

Which positioning would be appropriate?

Which charity will take the opportunity to diversify?

8. CONCLUSION

In conclusion, trading of local food is an environmental necessity and a significant business opportunity.

By backing it, British charities could reinforce their strategy, improve their market positioning and create value from the shift to a low-carbon economy.

From an ecological perspective, it would give public accessibility and visibility to local sourcing, creating a stable and vital distribution channel. This channel would be a new point of entry for goods in the low-carbon economy.

To launch the system, a charity must now take the risk of moving the point of equilibrium and of implementing this innovative business model!

Enabling Organisations and Individuals to Reduce Carbon Emissions using Mobile Positioning

by Srikanth Madani, University of St Gallen, Switzerland

1. INTRODUCTION

This paper describes how an organisation can enable its employees to measure and reduce their carbon footprint. The basic assumption is that most professionals in developed economies have mobile phones (with some people having more than one), and that the mobile phone is part of the modern urban lifestyle (ie people tend to have theirs on their person almost all the time), and that, through the very nature of their operative technology, mobile phone users can be tracked as they move from one place to another. Not just the movements of phone users, but also their mode of transportation can be ascertained, as described in a subsequent section. As models exist that can measure carbon or equivalent emissions for most means of transportation, per unit of time travelled, this will provide us with sufficient data to approximate monthly (or weekly) emissions per person. Users can then examine reasonably accurate reports of their carbon emissions, and can consciously try to reduce them.

The paper also examines existing location technologies; a paradigm for rolling out this project to a company; privacy concerns; and possible reporting models.

In future phases, this idea can be rolled out to non-employees, and indeed individuals might sign up directly with their communication service providers (CSPs) to receive measures of their carbon dioxide (CO_2) emissions, perhaps along with their phone bill.

The 98% window of opportunity

Using IT to reduce emissions is in line with the WWF paper, Becoming a Winner in a Low-Carbon Economy: IT Solutions that Help Business and the Planet,[1] which draws upon a 2007 Gartner study that assigns 2% of global CO2 emissions to the information and communication technology industry.[2] The WWF paper refers to the transformative power of IT – instead of focusing on reducing the 2% figure, we should see IT as part of the solution (the other 98%) – and outlines ten solution areas that will reduce one billion tons of CO_2 emissions by 2020, or sooner. On the flipside, however, most or all of these possible solutions require significant financial investment, or rely upon technology that needs time to mature, or require a significant change in business attitude.

The Measure-and-Reduce idea outlined in this paper uses existing technology, and attempts to enable people to measure their CO_2 emissions easily and hence to develop personal and corporate strategies to reduce them. Apart from the direct reduction of CO_2, the social value of this project lies in the awareness it builds up among its users, especially given the continuous reinforcing of the reduce-emissions message through monthly (or weekly) reports.

Conducive trends in the telecommunications industry

Given the high penetration of mobile phones in the developed economies, CSPs are increasingly looking at value-added services they can offer to their consumers, both to differentiate their own offering, and to keep their ARPUs (Average Revenue Per User – to use the industry term for income generated per subscriber) intact, given the ever-decreasing cost of simple voice calls.

Many of these additional services are Location Based Services, which rely upon being both able and allowed to ascertain the physical position of the mobile phone user, in order to provide him or her with personalised and immediately usable services, such as the location of the nearest vegetarian restaurant, for instance, or as part of a dating service, where interested users agree to be informed when they happen to be in the vicinity of other users, at certain venues, and between previously agreed-upon times.

1. Pamlin, D. and Pahlman, S. *Becoming a Winner in a Low-Carbon Economy: IT Solutions that Help Business and the Planet* (World Wide Fund for Nature).

2. Gartner (2009), 'Gartner Estimates ICT Industry Accounts for 2 Percent of Global CO2 Emissions (press release), <http://www.gartner.com/it/page.jsp?id=503867>.

As the demand for these services grows, it will become increasingly easy to locate individual mobile phones, and the accuracy of this facility will also increase. Indeed, one in ten mobile phone users in the US used a location-based service in the last quarter of 2008, with the number being twice as high for users of the immensely popular iPhone, a product regarded as transformational for the mobile industry.[3]

On the consumer side, an increasing number of people are demanding so-called 'smart phones'. A study by Juniper Research suggests that sales of smart phones will rise by 95% to over 300 million between 2008 and 2013, and that 23% of all mobile phones sold in 2013 will be smart phones.[4]

2. MOBILE POSITIONING OVERVIEW

A number of technologies exist which enable one to locate a mobile phone. These technologies are usually divided into two groups, based upon whether the network or the handset plays a pivotal role.[5] Which technology, or combination of solutions, is chosen depends upon the corporation's location (rural/urban) and the general nature of the phones (how modern they are).

Network-based solutions

Cell Global Identity (CGI) uses the identity of each cell (coverage area of a base station) and interacts with the phone to locate the user. It is often complemented with Timing Advance (TA) information, which is the measured time between the start of a radio frame and a data burst; this works with all existing terminals.

Uplink Time of Arrival (TOA) is similar to E-OTD (described below), the difference being that the uplink data (the data that are sent by the terminal) are measured. The base stations measure the time of arrival of data from the terminal. The base stations note the time difference and combine it with absolute time readings using GPS absolute time clocks.

Terminal-based solutions

Global positioning system (GPS) uses a set of satellites (usually 3–4) to locate a user's position. GPS now can achieve around 5m–40m accuracy provided there is a clear view of the sky.

Network Assisted GPS (A-GPS) uses fixed GPS receivers that are placed at regular intervals, every 200km to 400km, to fetch data that can complement the readings of the terminal. The assistance data make it possible for the receiver to make timing measurements from the satellites without having to decode the actual messages, greatly reducing the time needed for a GPS receiver to calculate the location.

Enhanced Observed Time Difference (E-OTD) uses software in the terminal only to examine the data received from surrounding base stations, to measure the time it takes for the data to reach the terminal from the user's phone. This time difference is used to calculate where the user is located relative to the base stations.

3. IDENTIFYING COMMUTE AND TRAVEL PROFILES

Using a number of parameters, the most common travel profiles (modes of transportation) can be uniquely identified, within an acceptable margin of error.

Walking

A user's measured speed will clearly reveal if the user is walking, as the rate of movement will be significantly lower than any other means of transport. The second check is the user's position, for many urban areas (such as the interiors of buildings) do not permit vehicles to enter. A third and more sophisticated check will be the travel pattern, i.e. how often does the user change direction? How long does the user stay still?

An additional benefit is that users will also be able to use their monthly miles walked to evaluate how active or sedentary their lifestyle is.

Cycling

Here too, the speed will be, on average, lower than for any mechanised means of transport, but faster than someone who is walking. Also, the movement pattern – mostly roads, but possibly also cycle paths, and occasionally carrying the cycle (i.e. walking) in crowded, urban areas – will help to identify a cyclist user.

Bus

Buses, although noticeably faster than pedestrians and cyclists, must follow a fixed route, and must often be at certain points (bus stops) at fixed times. Given that public transport timetables are freely available online, as is even real-time information on demand (e.g. as used by Google Maps, when showing various routes between two points), it should be fairly easy to ascertain whether a user is on board a bus.

Train

Trains have even more of a fixed route to follow, and it should be straightforward to identify a user on board a train. There might be boundary conditions on either side of a journey, where a user might not be traceable owing to line-of-sight obstruction, but this should only be a negligible part of total journey time.

Car

Cars are easily differentiated from trains on the basis of the route followed, and from pedestrians and cyclists on the basis of their higher speed. When compared with buses, although they both follow possibly similar routes, cars will make fewer stops (except at traffic lights, or in traffic jams), and will not stop at known bus stops.

3. <http://www.telecompaper.com/news/article.aspx?cid=657073>.

4. < http://www.telecompaper.com/news/article.aspx?cid=655850>.

5. < http://www.wirelessdevnet.com/channels/lbs/features/mobilepositioning.html>.

Car-pool

Identifying a car-pool is also possible, as long as the co-passengers are also part of the Measure-and-Reduce initiative. That being the case, a car-pool can be identified by checking whether a user is in the vicinity of one or more of his or her registered car-poolers. Of course, the first checks must be to ascertain that the user is indeed in a car, using the criteria described in the previous sub-section.

Flights

Flights are also easy to identify, for a user must be in the vicinity of an airport, followed by a period of mobile inactivity, and then reappearance of the mobile signal in a location significantly far away from the origin. Given the tendency of most users to switch their mobile phones back on as soon after touchdown as permitted, and not to switch off until the last minute at the beginning of a flight, the flight distance can be approximated. Of course, this does not take into account delays where the aircraft waits on the runway (i.e. where mobile phones may not be used, as opposed to a delay where the user is still within the airport buildings), but this is a low-frequency event.

4. MANAGING ORGANISATIONAL CHANGE

I now suggest a phased roll-out of this project in the context of a corporation.

1. Ensure that top management is committed, and supports the required change.

2. Set up an internal marketing campaign for the employees, with special emphasis on the urgency of reducing CO_2 emissions, and the seriousness of climate change.

3. Obtain buy-in from employees, by addressing privacy concerns and being transparent about compensation schemes (if any).

4. Set up a volunteer group, and kick off a pilot project, using the experience to improve reports and test design assumptions.

5. Roll out Measure-and-Reduce across the organisation.

6. Bring in internal marketing to celebrate early wins.

7. Set up a feedback process to improve reporting.

8. Extend the scheme to family members, and a limited number of non-employees (e.g. suppliers).

5. DATA ANALYSIS AND PRESENTATION

Reporting the collected data in an easy-to-understand format is key to the success of this project. The organisation, in consultation with its employees, should decide upon the metrics that are most relevant to it. Some categories are listed here.

Individual daily carbon emissions

Each user receives a monthly progress report, which consists of a graph showing his or her daily CO_2 emissions, with (probably) troughs on the weekends, and occasional spikes representing a visit to a client site, etc.

Peer group comparison

A group of employees, perhaps those in the same team, or those at the same level in the hierarchy, or those who perform a similar function, even if not in the same business unit, might want to be part of a virtual peer-group, where relative emissions can be examined. For example, sales professionals might need to travel a lot, and it would be unfair to club them with someone who has to commute to the same location every day.

Organisational progress

At an organisational level, senior managers can track their progress in limiting their carbon emissions, and can use this information to influence their decisions on working from home, or loans for bicycles, preferential parking areas for car-pool users, financial compensation for those who are able to reduce their CO_2 output by a certain level, etc.

6. PRIVACY PROTECTION

Given that the measure-and-reduce idea calls upon people's movements to be tracked throughout most of their day, one must be certain that due attention is paid to considerations of privacy.

No additional data collection

Through the very nature of a cell phone's operations, a CSP can track a user's movements, by examining which cellphone towers the phone has interacted with. In most countries, the CSP requires approval from the user before this data can be stored for processing. This project does not call for any additional data to be collected.

Anonymous reporting

All reports not meant specifically for the individual user, such as comparative emissions sizes or growth across the organisation or within a division, should not contain any information that allows individual users to be identified.

Tracking restricted to business hours

Companies and employees might choose to restrict CO_2 emissions monitoring only to business hours during the working week, and not at all on weekends and during time-off. Similarly, business travel will count towards emissions, but not overseas holidays.

Voluntary opt-out option

All users should be able to opt-out of the monitoring using a simple mechanism, either via an SMS (text message) to a service number (free of charge), or a setting on the phone itself (for more sophisticated phones). This opt-out might be temporary, lasting for a few hours or a day, or permanent (i.e. till the user decides to opt-in again).

7. SUMMARY

Apart from the collective benefit to all of us who share the planet, the corporation will see the following advantages, as a result of having reduced carbon emissions.

1. Increased profits – if regulators will allow reduced carbon emissions from employees' commute to be recognized as part of an organisation's carbon footprint, and thus grant it extra carbon credits, or reduce its need to buy these credits.

2. Engaged employees – the company should see a rise in positive organisational energy, as employees feel that they are consciously contributing to a cause that concerns us all.

3. Healthier employees – depending upon how feasible it is, employees will probably walk or cycle more often, as opposed to using a mechanised form of transport, in an effort to reduce their emissions, and this will naturally translate into a fitter workforce.

Algapower: Shifting to a Low-carbon Economy by Producing Algae-based Biofuel

by Doreen Bunke, Didier Engels, Jana Mancevova and Björn Wenzlaff, ESSEC & Mannheim Business School, Germany

1. SECOND GENERATION BIOFUEL AS A MAJOR CONTRIBUTION TO SHIFTING THE TRANSPORT SECTOR TO A LOW-CARBON ECONOMY

The value propositions of most excellent new businesses are based on sustainable answers for the greatest challenges of their time. The increase in CO_2 emissions and its impact on global climate conditions is doubtless one of these challenges: 'The scientific evidence is now overwhelming: climate change is a serious global threat, and it demands an urgent global response'.[1] Further major global challenges include diminishing fossil fuel reserves, finite natural resources that are needed to serve an expanding world population, and an increasing worldwide energy demand (+1.6 % a year until 2030 if no measures are taken).

Figure 1: World primary energy demand by region
International Energy Agency (IEA) Reference Scenario[2]
Figures in million tons of oil equivalent (mtoe)

	1980	2000	2006	2015	2030	2006-2030*
OECD	4 072	5 325	5 536	5 854	6 180	0.5%
North America	2 100	2 705	2 768	2 914	3 180	0.6%
United States	1 809	2 300	2 319	2 396	2 566	0.4%
Europe	1 504	1 775	1 884	1 980	2 005	0.3%
Pacific	467	845	884	960	995	0.5%
Non-OECD	3 043	4 563	6 011	8 067	10 604	2.4%
E. Europe/Eurasia	1 267	1 015	1 118	1 317	1 454	1.1%
Russia	n.a.	615	668	798	859	1.1%
Asia	1 072	2 191	3 227	4 598	6 325	2.8%
China	604	1 122	1 898	2 906	3 885	3.0%
India	209	460	566	771	1 280	3.5%
Middle East	133	389	522	760	1 106	3.2%
Africa	278	507	614	721	857	1.4%
Latin America	294	460	530	671	862	2.0%
World**	7 223	10 034	11 730	14 121	17 014	1.6%
European Union	n.a.	1 722	1 821	1 897	1 903	0.2%

* Average annual rate of growth.
** World includes international marine bunkers.

What are the criteria that a 'perfect' innovative business idea should fulfil to support the shift to a low-carbon economy? We believe that the following criteria are important.[3]

1. The business is financially sound.
2. Energy is produced by using low-carbon energy sources and methods – renewable and alternative energy sources and fuels .
3. Natural resources are used efficiently and the natural habitat is not destroyed.
4. Waste is minimised.
5. Local needs are served by local production (food, materials, energy), if feasible.

Hence, the perfect innovation offers a triple dividend: financial profits as well as additional environmental and social benefits.

Which area offers the greatest opportunities? From our point of view, the transport sector is most promising, for various reasons.

Figure 2: World final energy consumption by sector
(IEA Reference Scenario) (mtoe)[4]

	1980	2000	2006	2015	2030	2006-2030*
Industry	1 779	1 879	2 181	2 735	3 322	1.8%
Coal	421	405	550	713	838	1.8%
Oil	474	325	329	366	385	0.7%
Gas	422	422	434	508	604	1.4%
Electricity	297	455	560	789	1 060	2.7%
Other	165	272	307	359	436	1.5%
Transport	1 245	1 936	2 227		3 171	1.5%
Oil	1 187	1 844	2 105	95%	2 915	1.4%
Biofuels	2	10	24	4%	118	6.8%
Other	57	82	98	1%	137	1.4%
Residential, services and agriculture	2 006	2 635	2 937		3 918	1.2%
Coal	244	108	114	118	100	-0.5%
Oil	481	462	472	493	560	0.7%
Gas	346	542	592	660	791	1.2%
Electricity	273	613	764	967	1 322	2.3%
Other	661	910	995	1 073	1 144	0.6%
Non-energy use	348	598	740	876	994	1.2%
Total	5 378	7 048	8 086	9 560	11 405	1.4%

* Average annual rate of growth.
Out of which 27% transport

1. Stern, N. (2006), *The Stern Review: The Economics of Climate Change* (HM Treasury).
2. IEA (2008), *World Energy Outlook*, p. 81.
3. See also: <http://www.lowcarboneconomy.com/LCE/AboutALowCarbonEconomy>.
4. IEA (2008), *World Energy Outlook*, p. 84.

The transport sector counts for 27% of world energy consumption and for 6.3 billion tons of the world's CO_2 emissions (about 22% of the total), with an expected growth of 1.4% a year up to 8.7 billion tons in 2030.

Figure 3: World CO_2 emissions
(IEA, Reference Scenario) (Mio. T)[5]

	CO_2 emissions (Mt)						Shares (%)		Growth (% p.a.)
	1990	2006	2015	2020	2025	2030	2006	2030	2006-2030
Total CO_2 emissions	20 945	27 889	34 003	36 399	38 687	40 953	100	100	1.6
Coal	8 309	11 678	15 402	16 702	17 890	18 628	42	46	2.0
Oil	8 824	10 768	12 079	12 663	13 193	13 670	39	34	1.0
Gas	3 812	5 443	6 523	7 033	7 603	8 254	20	20	1.7
Power generation	7 484	11 435	14 803	16 005	17 116	18 050	100	100	1.9
Coal	4 928	8 336	11 113	12 101	12 942	13 507	73	75	2.0
Oil	1 198	882	852	774	713	647	8	4	-1.3
Gas	1 358	2 217	2 839	3 129	3 461	3 895	19	22	2.4
Total final consumption	12 449	15 118	17 635	18 663	19 625	20 475	100	100	1.3
Coal	3 246	3 135	3 996	4 218	4 403	4 527	21	22	1.5
Oil	7 062	9 220	10 501	11 121	11 687	12 210	61	60	1.2
of which transport	4 390	6 263	7 292	7 796	8 249	8 680	41	42	1.4
of which marine bunkers	Transport represents ca. 22 % of total						4	4	1.0
of which international aviation							3	3	2.0
Gas	2 141	2 763	3 139	3 324	3 536	3 739	18	18	1.3

Conventional oil is still the dominant fuel (share: 94 %), but it has the lowest (static) reserves-to-production ratio (about 41 years) compared with other fossil fuels[6] and will diminish most quickly.

New technologies such as hybridisation, fuel cells, hydrogen and electrical cars using renewable electricity are potential future options, but some of these technologies will need years for commercial introduction. Hence, biofuels are the first energy alternative for existing propulsion systems, for the near future. Currently biofuel plays only a minor role (share: 1%).

Nonetheless, according to the IEA, the consumption of biofuels will quintuple from 24 to 118 mtoe until 2030 (+ 6.8% a year), offering an outstanding business opportunity with additional potential if conventional oil depletes faster than expected, with increasing governmental support for biofuels, and strongly rising oil demand causing high oil prices.

Nonetheless, currently used first-generation biofuels (e.g. palm and soybean oils) have several adverse social and environmental aspects. They contribute to higher food prices owing to competition with food crops that also use arable land and potable water (that is, they are food-competitive). Additionally, they accelerate deforestation and have a potentially negative impact on biodiversity.[7]

Hence, second-generation biofuels, which have superior sustainability criteria to first-generation biofuels (see above) offer a great opportunity to use the market potential of biofuels sustainably.

2. ALGAPOWER'S INNOVATIVE APPROACH: SHIFTING TO A LOW-CARBON ECONOMY WITH ALGAE

Our innovative idea is to produce a second-generation biofuel based on algae by setting up a start-up company called Algapower.

Algapower's business model will deliver algae-based solutions for sustainable, efficient production of renewable primary energies. Algapower will use its algae production to deliver competitive, sustainable algae-based oil for biodiesel production while generating CO_2 reduction certificates and, as a second by-product, algae cake. The goal is to produce and commercialise a cost-competitive second-generation biofuel based on R&D and scaled-up algae production.

Why are algae-based biofuels the perfect innovation for the move towards a low-carbon economy?

2.1 Advantages of algae-based biofuels

Algae oil has the potential to replace a significant share of fossil fuels owing to its outstanding advantages. In particular, algae:[8]

- have a higher photon conversion efficiency (as measured by increased biomass yields per hectare) than any other feedstock in the world
- can be harvested nearly all year round, providing a reliable and continuous supply of oil
- can use salt and waste water streams, thereby greatly reducing freshwater use
- can (during their growth) absorb and capture CO_2 (so that the oil produced is a CO_2 neutral fuel)
- are non-food competing feedstocks and production does not use arable land.

The energy content of microalgae is also outstanding. The following chart shows qualitative and quantitative advantages of algae compared with other feedstocks used for biofuel production.

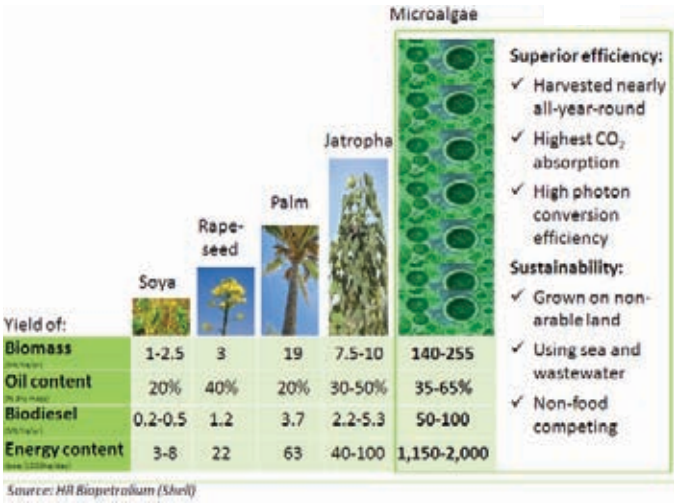
5. IEA (2008), *World Energy Outlook*, p. 507.

6. IEA, *Advanced Motor Fuels*, Annex XXXIV, p.45, <http://www.iea-amf.vtt.fi/pdf/annex34_report_final.pdf>.

7. IEA (2008), *From 1st to 2nd Generation Biofuel Technologies*, p. 8.

8. Doct. Benemann at Algen Stammtisch (Hamburg, 2008).

Figure 4: Advantages of algae compared with other feedstock for biofuel production[9]



Therefore, algae-based biofuel is perceived as one of the most promising alternatives for today's biodiesel engines but also for tomorrow's hydrogen technologies, since it avoids many negative impacts associated with 'first-generation' biofuels.

2.2 Implementation of the business idea

The business will be implemented as follows.

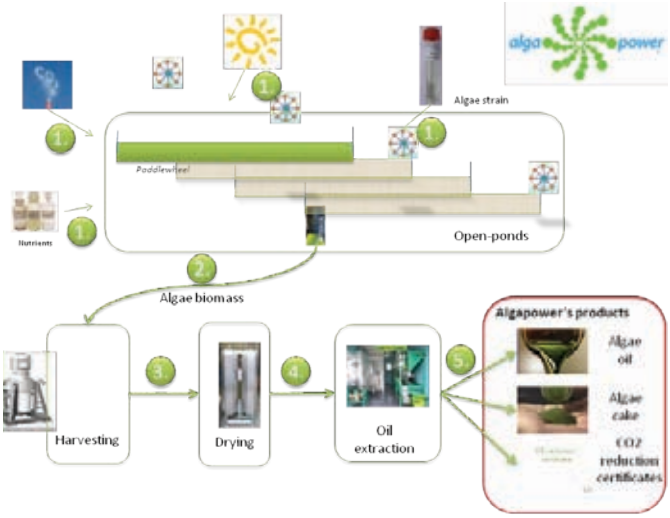
2.2.1 The value chain and production process

Using a value chain analysis, one can see that Algapower is based on core competencies with the highest potential for value creation (see Figure. 5). Therefore, we concentrate here on the algae oil production process, since this is a major qualification for developing an algae-based energy business. The business plan excludes forward integration such as investing in refineries or building up a distribution channel to reach B2C customers, because this is very capital intensive and does not offer interesting opportunities, owing to its competitiveness and because it would reduce flexibility for future applications. Algapower's business plan focuses on the parts of the value chain shown in Figure. 5.

Figure 5: Algapower's value chain

The production process and algae growth in cultivation systems are influenced by various physical and biological factors such light, temperature, availability of CO_2,[10] salinity, nutrients, turbulence, and contamination. Each algal species has a different optimum level for each factor. Once the algae have reached their maturity stage and right lipid content, the harvesting process starts by concentrating the algae and removing the excess water, before the algae are dried. Pressing extracts the oil, leaving the cake as a by-product. The oil is stored in tanks and the cake in a warehouse until the final delivery, which will be shortly after the production process ends. The production process includes four major steps, illustrated on the following chart.

Figure 6: Algapower's production process



The proposals for the setting-up of a first pilot plant are based on today's best available knowledge, and the equipment obtainable in the market, and would have to be confirmed before actual investment. Algapower has so far made the following choices.

- Algal strain selection: from a variety of 30,000 species of alga, Dunaliella has been selected because its high salinity eliminates the risk of contamination.[11]
- Alga-growing equipment: we will use an open pond, including a paddlewheel-driven recirculation raceway, fitted with a durable plastic liner (potentially using currently unused Salinas). To improve the growing conditions, a removable cover system will be built above the ponds. Inoculating[12] ponds and settling ponds[13] will be added next to the main open ponds. These will help with monitoring the temperature and limiting the risk of contamination.

9. <http://www.hrbp.com/Algae/AlgaeOil.html>.

10. Intensive algae cultivation requires additional CO_2 injection to obtain high growth rates.

11. Weldy/Huesemann, Lipid Production by Dunaliella Salina in Batach Culture.

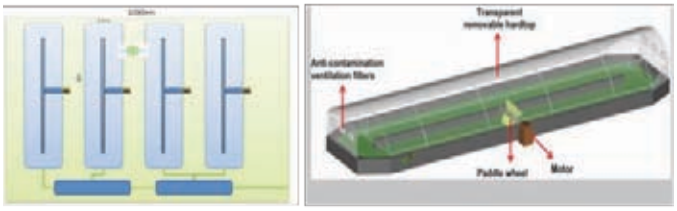
12. Field incubation and seeding pond is taking place in the inoculating pond.

13. The settling ponds are used for gravitational condensing of algal biomass.

- Harvesting: centrifugation is to be used, as this is a proven technique for crops and algae.[14]
- Oil extraction: only a small manual mechanical press is used, owing to low volumes in the beginning.

A lab for quality measurement, tanks, warehouse and an office are to be built separately.

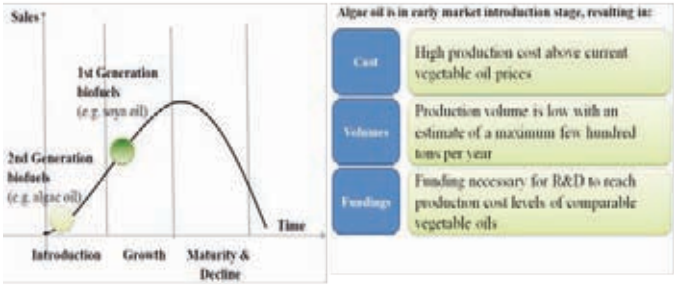
Figure 7: Set-up of Algapower's pilot farm and example of pond with cover[15]



2.2.2 Business development over time

Algae-based biofuels are in a very early market stage and are not yet cost competitive.[16]

Figure 8: Algae oil within the overall biofuel product life cycle



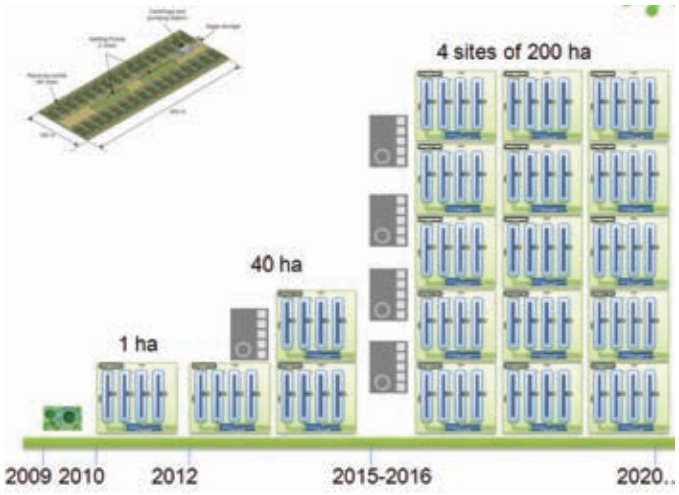
Because of this situation, a three-step approach for business development is appropriate.

Phase 1: Market entry with pilot farm (2009–11)
Algapower enters the market with an open-pond pilot plant (1 hectare with four ponds), starts producing algae oil and algae-based by-products as from 2010. The goal is to show feasibility under real conditions and to prove Algapower's competency in running an algae farm effectively. According to actual needs, each single pond might be used differently for experimental purposes.

Phase 2: Initial growth phase (2012–14)
On the basis of the experiences with the pilot, production and algae strain development within the pilot and general R&D achievements in the scientific world (alga growth rates, lipid content), Algapower scales up production in open ponds (40 hectares). The goal is to become cost competitive (decrease production cost to market price levels of other biofuels), to be among the first movers scaling up production, to prove that scaling up works, to strengthen the business position, and to reach profitability.

Phase 3: High-growth phase (2015–20)
The goal is to reach prosperity. On the basis of previous experiences with a larger-scale production using a mixed system (open pond; Photo Bioreactor), Algapower scales up production significantly (four sites; total superficies: 800 hectares). The goal is to be among the first movers scaling up substantially, with a mixed system to strengthen the company's business position.

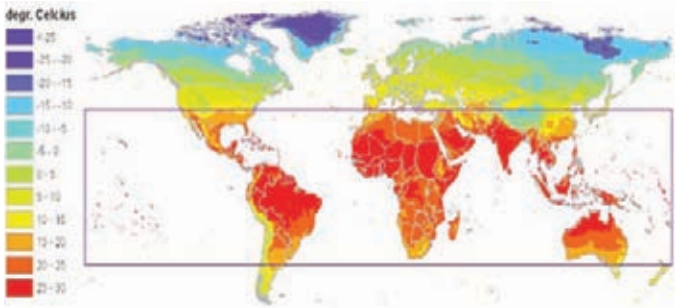
Figure 9: Algapower's business development over time



2.2.3 Potential production countries

Algae grow worldwide, but their growth and thus their oil production are a function of sunshine duration and temperature. The following map illustrates that locations between the 37° north and south latitudes offer optimal climatic conditions for algal growth, enabling developing and emerging countries to produce algae in the future.

Figure 10: Suitable climatic conditions for microalgae processes[17]



14. Information based on personal visit at Algomed <http:// www.algomed.de> and Algaelink <http://www.algaelink.com>.

15. A modular pond with optional cover protection is proposed by Bioking NL.

16. <http://news.cnet.com/8301-11128_3-10043996-54.html?tag=untagged; http://www.itwire.com/content/view/24203/1176/>.

17. Harmelen, Onk (2006), *Microalgae Biofixation Processes: Applications and Potential Contributions to Greenhouse Gas Mitigation Options*, p. 23.

These countries might potentially reduce their dependency on oil imports, strengthen their local economy (jobs, taxes, improved trade balance) and might produce for the world oil market, if domestic demand is not sufficient. Owing to their closeness to the European biofuel market, countries in North Africa (such as Morocco) offer very interesting possible locations for algae production targeting the European biofuel market.

2.3 Products, customers, markets and future perspectives

In the first phase, Algapower concentrates on its core products, whereas the future products and customer perspectives are much broader, illustrating the huge potential of the approach.

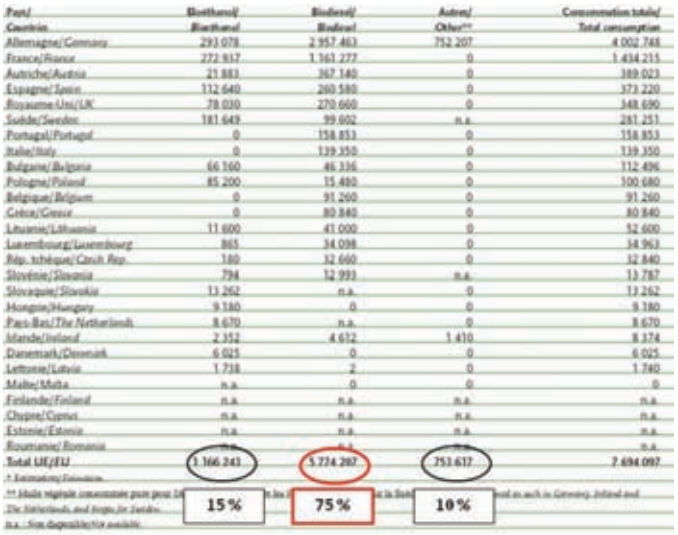
2.3.1 Products, customers and markets in the first phase

Algapower will now be producing three products: algae oil for biofuel production and two by-products: CO_2 reduction certificates and algae cake.

Algae oil

In the market entry phase, it is crucial to win the first customers. Therefore, the EU biofuel market is Algapower's target market because it combines the advantages of a big existing market (biofuel consumption: 7.7 Mio. toe (2007)) with excellent growth prospects (the EU intends to increase biofuels' share of its domestic market to up to 10% of its fuel consumption by 2020 (currently 1.6%)). The market segment and customers that Algapower aims to supply are biodiesel refineries, since the biodiesel market (requiring vegetable oil) is the biggest market with a demand of 5.7 Mio. toe (75%), whereas bio-ethanol (15%) and others (10%) are less attractive (Figure 11). More specifically, biodiesel refineries in Spain are a very attractive market since their number is rapidly increasing, domestic vegetable oil production is low and the government is supportive.

Figure 11: Breakdown of EU biofuel consumption (2007)[18]



CO_2 reduction certificates

Algapower intends to generate CO_2 reduction certificates and to generate revenues by selling these certificates within the project-based mechanisms of the Kyoto Protocol. If entities from industrialised countries invest in emissions reduction projects in developing countries (CDM – clean development mechanism) these certificates are called Certified Emission Reductions (CER).[19] Since Algapower wishes to concentrate on core competencies, the company intends to sell primary CER to a CO_2 project developer in order to avoid the certification process. A worldwide market for primary CER exists (550 Mio. t CO_2; US$7.4 billion).

Figure 12: The carbon market (2006–07)[20]

	2006		2007	
	Volume ($MtCO_2e$)	Value (MUS$)	Volume ($MtCO_2e$)	Value (MUS$)
Allowances				
EU ETS	1,104	24,436	2,061	50,097
New South Wales	20	225	25	224
Chicago Climate Exchange	10	38	23	72
UK ETS	na	na		
Sub total	**1,134**	**24,699**	**2,109**	**50,394**
Project-based transactions				
Primary CDM*	537	CER	551	7,426
Secondary CDM	25		240	5,451
JI*	16	141	41	499
Other Compliance & Voluntary Transactions	33	146	42	265
Sub total	**611**	**6,536**	**874**	**13,641**
TOTAL	**1,745**	**31,235**	**2,983**	**64,035**

Algae cake

Algae cake, the remaining by-product after extracting the oil, can also be used. Potentially three algae cake market segments exist: those for animal nutrition additives, compost mixture (fertiliser) and biomass for power plants. The animal nutrition market is the most suitable market segment since the cake is high in protein, which is a valuable nutrient in animal feed.[21]

2.3.2 Future products, customers and markets

Algapower's present focus is on producing feedstock for biofuel production and its by-products, considering the already-promising future prospects for the product, the industry, and the solutions they offer for current needs and geographical development.

18. EurObserv'ER (2008), <http://www.energies-renouvelables.org/observ-er/stat_baro/observ/baro185.pdf>.

19. <http://www.dehst.de/cln_090/nn_484538/SharedDocs/Downloads/DE/JI__CDM/JI-CDM__CDM__Manual__englisch,templateId=raw,property=publicationFile.pdf/JI-CDM_CDM_Manual_englisch.pdf>.

20. World Bank (2008), *State and Trends of the Carbon Market* (Washington DC).

21. <http://www.fao.org/ag/aGa/AGAP/FRG/FEEDback/Irrd/Irrd6/3/2.htm; http://www.byrneltd.com/documents/WorldCongressonIndustrialBiotechnology_002.pdf>, slide 2.

a. Product extension/development

The scientific community sees algae biomass production as a potential source of bioethanol or hydrogen. First, the market of bioethanol is developing continuously (up 11% in 2006–07). Second, algae have all the characteristics necessary to replace the current non-sustainable and rare feedstocks bought by the bioethanol producers.

'Researchers studying a hydrogen-producing [alga], Chlamydomonas reinhardt, have unmasked a previously unknown fermentation pathway that may open up possibilities for increasing hydrogen production'.[22]

Additional R&D is required to make these algae-based productions efficient and cost competitive.

b. Industry extension

Currently, algae-based biofuel development focuses on the use of this fuel in road transport vehicles. There is, however, an increasingly promising outlook for Jetfuel production. Algae-oil has considerable advantages compared with other feedstocks, and critical prerequisites such as energy density and low-temperature fuel properties are met. Airlines such as Japan Airlines, KLM, and Continental Airlines have already conducted successful test flights with algae-oil-blend fuels (from 2–3% up to 50% share of the kerosene content).

c. Business model development and extension of value chain

An attractive outlook is the offering of a scalable key-turned solution to customers from various sectors aiming for sustainable business development. Algapower will deliver its expertise along the end-to-end process: evaluation, set-up, implementation and operations.

These customers will thus have their own algae production facilities, absorbing a significant volume of CO_2 and producing their own algae-based products such as biofuel for their own needs. The model is applicable both to big industries such as the cement business (where the algae oil production will provide CO_2 absorption and biofuel for the company's own cars/trucks pool), and to smaller customers such as farmers (absorption of CO_2 from livestock, production of biofuels for their own agricultural engines, and algae cake for use as livestock nutrition or fertiliser).

d. Geographic extension worldwide, especially for emerging countries

Algapower believes that algae can also be a sustainable solution for emerging countries that have a strong dependence on petrol imports and a growing energy demand. Moreover, algae offer a decentralised solution that can be duplicated throughout any country that has favourable weather conditions. Within the forthcoming agreement (after the Kyoto Protocol), we are convinced that all countries will have to commit to contributing to reduction of CO_2 emissions.

3. HOW DOES ALGAPOWER CREATE VALUE?

Algapower creates economic, social and environmental value for various stakeholders. Algapower's innovative business model and new products are bridging the gap between different sectors – agriculture, energy production and CO_2 reduction – with a scalable concept that can operate globally.

3.1. Economic value creation for investors: financially feasible business model

Algapower offers a lucrative and visionary opportunity for investors who are convinced that algae-based biofuel is a promising solution for the problem of shifting to a low-carbon economy:

- an algae pilot farm as from 2010
- an attractive project generating CO_2 certificates
- a phased financial investment (€4 Mio; €8 Mio; €85Mio.) over a period of seven years.

Investors might expect, on the basis of certain assumptions regarding oil and CO_2 price developments, assumed enhancements regarding algae growth rates and lipid content, and estimated required investment and costs, that:

- revenues would grow steadily, reaching €108 Mio. in 2016 with increasing profitability from 2013
- a positive net present value (NPV) (€6 Mio.) can be achieved on the basis of a risk-adjusted weighted averaged cost of capital (WACC) of 26%.

The expected return of the business model is very sensitive to changes in oil prices and achieved success in the algae-related R&D, with a serious potential of €50+ Mio. NPV with rising prices and greater-than-expected R&D progress.

3.2. Social value creation for developing and emerging countries and customers

Algapower creates social value because:

- dependency on crude oil can be reduced, which strengthens both the trade balances of countries without fossil fuel supplies and the security of supply
- algae-based biofuel offers the opportunity to develop a decentralised approach to producing oil and algae cake: local production for local needs
- tax revenues are generated by the creation of local jobs and local business activities.

22. <http://www.sciencedaily.com/releases/2009/03/090324171556.htm>.

Algapower offers its customers the opportunity to use a sustainable biofuel, giving them the opportunity to continue using individual transport vehicles without the negative environmental and social impacts of current use of crude oil and first-generation biofuels.

3.3. Environmental value creation on a global and local level: algae oil is renewable and sustainable

Algapower offers a sustainable net-CO_2-free biofuel. The projection for 2015 alone, assuming algae oil production of 150,000 tons, is that Algapower's contribution will avoid CO_2 emissions of 390,000 tons. If algae oil wins a market share of just 0.1% of the world oil market, CO_2 emissions will be reduced by 6–7 million tons.

Since algae are grown on non-arable land using salt water, their production secures natural resources and protects the natural habitat locally. Additionally, almost no waste is produced since all the products of the process can be used.

Algapower, with its algae-based biofuel, is the perfect approach for shifting to a low-carbon economy since it offers a triple dividend in economic, social and environmental terms, while fulfilling all the criteria necessary for a business within a low-carbon economy.

Never Ending Race

by Ian Stevens, University of Portsmouth, UK

I won the Vendée Globe before the start with the choices I made, with the team and with the experience I have built up. Eighty per cent of the end result is before the start of the race.

MICHEL DESJOYEAU, WINNER VENDEE GLOBE 2008/09

Put simply, to create value in a low-carbon economy demands that business, government and civil society remain a 'going concern' by mitigating associated risks and exploiting opportunities with the best returns.

Yet, knowing that climate is profoundly changing in response to decades of industrialisation, bringing challenges such as shifting political and civil landscapes, changes in urbanisation, including migratory refugees, resource provision and use, with problems such as water shortages,[1] collapsing ecosystems and vulnerability to the physical effects of extreme weather events,[2] the business community's accepted notion of 'wealth', whether individual or national, is being exposed as a chimaera by the current financial crisis. Adam Smith's 'invisible hand' principle of a self-interested society has failed in the financial markets and these lessons are pertinent for eco-regulation and reporting.

NEW VALUE MODEL

Today, a stock's real value is adjusted by financial markets on the basis of the views of investors and speculators but, recalling the 2050 emission goals of the Stern Report,[3] we find society's tacit acceptance of the few making fortunes from betting on movements of 'value' diminishing as sympathetic media juxtapose this with images of hard-pressed workers toiling to keep the administrator at bay. Similarly, if society adopts CO_2 austerity it should not tolerate the parasitic profiteering of a few in a 'greenhouse gas trading room'.

Goldman Sachs' GS SUSTAIN reports[4] that portfolio valuation remains based on cash returns, not growth, to drive share price performance and sustain competitive advantage. Yet Assadourian[5] maintains that not all growth is good, directly contradicting the established definition of value as espoused by Copeland et al.,[6] which takes no account of the concept of a low-carbon economy or the sustainability of the environmental and social networks within which companies exist.

Certain cultures do, however, determine value differently: the Scandinavians are rated highly on environmental (E) and social (S) issues while Anglo-American companies rate highly on corporate governance (G). So drawing all three ESG measures together to quantify sustainable success, and hence value, appears appropriate when trying to place a realistic value on the environment and the future in which we all share. GS SUSTAIN assesses ESG criteria as long-term investment opportunities, translating them into financial performance and, ultimately, returns.

1. Bates, B.C., Kundzewicz, Z.W., Wu, S. and Palutikof, J.P. (eds) (2008), *Climate Change and Water* (Geneva: IPCC Secretariat). <http://www.ipcc.ch/ipccreports/tp-climate-change-water.htm> accessed 9 February 2009.

2. WMO (World Meteorological Organisation) (2008), 'The Challenges of Climate Change Adaptation', *World Climate News*, No. 33, June. <http://www.wmo.int/pages/publications/world_climate_news/documents/wcn_33_en.pdf> accessed 11 January 2009.

3. Stern, N. (ed.) (2006), *The Stern Review: The Economics of Climate Change*, <http://www.sternreview.org.uk> accessed 11 January 2009.

4. Goldman Sachs (2008), <http://www2.goldmansachs.com/ideas/environment-and-energy/gs-sustain/index.html> accessed 11 January 2009.

5. Assadourian, E. (2008), *Global Economic Growth Continues at Expense of Ecological System* (Worldwatch Institute).

6. Copeland, I., Koller, T. and Murrin, J. (2000), *Valuation: Measuring and Managing Value of Companies* (3rd edn) (McKinsey & Company).

Unless the Market is abolished, then value myopia should be replaced with the concept of a sustainable going concern, locally and for the planet, achieved without causing collateral damage elsewhere, such as disposal issues or the hiding of emissions in other, less carbon-conscious countries. Sceptical investors would determine value against evidence that a company's future action plans will really achieve the promised results, such as mitigating emissions or adapting sufficiently to maintain momentum towards the low carbon vision. This concept of value would be empirical, fact-based, not speculative, and in line with 'triple bottom line' thinking encompassing people, plant and profit.[7]

Realigning today's short-term financial reward to meet the UK's 2050 emission targets without falling foul of government regulation, however contrary, should be at the top of the strategic agenda. The following longer-term concepts may require companies to reshape their models, for example:

- the introduction of sliding-scale corporate carbon taxes for emission compliance, the least compliant being highly taxed and the most compliant receiving reduced tax, or
- a 'new' Value Added Tax concept based on the new definition of value where tax credits are allocated to companies that have met, or bettered, their CO_2 targets; and where liquidated damages are imposed on those who have failed
- possibly altering personal tax such as introducing a new 'decision-maker' executive salary tax of 55% or more, rebated at 15% when future milestone points deliver the promised executive-sponsored strategic emission target; failure to deliver would result in the cancellation of the rebate, and
- staff and contractor bonuses 'held' until the expected benefits are realised, however far into the future; the bonus entitlement expires if the benefits are not delivered to plan.

These models would account for all value-chain cradle-to-cradle/grave emissions, with the following consequences.

- Where a company acts as the satrap 'owner' of the whole supply chain it would be accountable for all the input/output emissions in the whole chain. The emission regulations of the satrap 'home' country, say as at 2009, would be applicable across the whole chain: call this a carbon group. It corrals companies across the globe in the 'raw-material-to-sale-to-disposal' chain for the purposes of calculating emissions.
- The group prevents carbon leakage, where emitters relocate to avoid regulations and restrictions, as the satrap concept annuls the benefit of relocation. No place to hide. The persistently 'dirty' groups may suffer multilateral sanctions if they persist in remaining outside international agreements.

This will force new thinking about reducing consumption and its cost, as the following examples illustrate.

- Demand-side economics will supersede supply-side consumption-related economics. For example, the energy market's move from Megawatts to tradable Negawatts, to kill-a-watt, where one would just turn it down or off to conserve and save. So, for business travel, this could mean being compensated when using new networking technology rather than travelling.
- It may drive new thinking on paying workers, such as offering 'salary sacrifice' where a percentage of pre-tax salary would be paid, tax-free, into an account where one could only purchase approved 'green' products or services, thus giving up to 40% per pound more purchasing power: corporate currency.

FUTURE OPERATING MODEL

Having redefined 'value' and readjusted corporate behaviour, the opportunities of moving to a low-carbon economy should be seized. In stating that America would not be 'hostage to dwindling resources, hostile regimes and a warming planet', President Obama linked national security, prosperity and environmentalism. So, apparently the opportunity is large, yet, at the business coalface the board members, as at Frito-Lay,[8] lie awake at night pondering: 'Will climate change bring new opportunities or kill my company's value, and where in the value chain do we produce these killer climate change triggers?'

Aligning a company's present and prospective performance with compensation packages is complex, whether it is done on a purely financial basis or an emissions basis, the latter oriented towards shaping future and sustainable performance, rather than erroneously chasing ephemeral profits. For 'new' value to be assessed and rewarded, explicit disclosure of achievement against plan must have transparent, auditable and consistent indicators, such as the standard calculation of a GHG footprint at annual milestones through to 2050. So, provided that companies such as Barclays[9] compile their own carbon accounting and offsetting protocols on the basis of the Work Resource Institute's report Hot Climate, Cool Commerce: A Service Sector Guide to Greenhouse Gas Management' and DEFRA's 'Environment Key Performance Indicators:

7. Elkington, J. (1994). 'Towards the Sustainable Corporation: Win-win-win Business Strategies for Sustainable Development', *California Management Review*, Review 36/2: 90–100. Brown, D., Dillard, J. and Marshall, R.S. (2006), *Triple Bottom Line: A Business Metaphor for a Social Construct* (Portland: Portland State University, School of Business Administration).

8. Carbon Trust. *Carbon Footprints in the Supply Chain: Walkers Snack Foods*. <http://www.yhub.org.uk/resources/Climate%20Change%20Micro%20Site/CarbonSupply%20Chain.pdf> accessed 11 January 2009.

9. <http://www.barclays.com/sustainabilityreport07/e_kpi.html> accessed 10 January 2009.

Reporting Guidelines for UK Business', then policymakers will ensure that they do not distort competitiveness.[10]

Today's short-term focus has meant that business systems are not set up to track strategic deliverables and performance against plan, so investment is required to get information from a variety of sources, databases and calculation engines, all re-built on an agreed set of rules. If the rules are wrong then discovery may take years, as with the recent case of overpayment of Civil Service pensions. There should be one global measurement standard and system, auditable by an accredited body,[11] preferably one recognised by the UNFCCC. It should aim for favourable rankings on influential indices such as FTSE4Good Environmental Leaders Index and the Dow Jones Sustainability Index.

To this end, an oversight body, possibly a board of trustees, would own the national climate change mandate, with a fiduciary duty to report honestly to the public on the rolled-up benefits, and to audit against the targets that warn of short-falls. The goal is for GHG emission to peaking in 2020 and reduce drastically by 2050, while avoiding criticism such as that recently levelled at the Fair Trade association for not being impartial and for the uselessness of having announced inspections.[12] Trustee boards from each country would produce one global annual report which would 'catch' concessions, such as Poland's negotiated permission to continue burning coal,[13] as 'off-balance sheet' activities, so the full picture would get reported, irrespective of weak-willed politicians' agreements.[14]

This oversight board would ensure that measures, be they emissions-, intensity- or consumption-related, were based on the inclusive carbon group concept, and they would have a duty to flush out fraudulent claims and projects.[15] The business-as-usual scenario, permitting geo-engineering, cap-and-trade and carbon offset mechanisms, would be tracked to verify positive impact on carbon levels or reveal whether the measures taken are just ineffectively absolving emission 'sins' as a sort of modern version of the sale of indulgences by the Catholic church in medieval times.

As rigorous reporting standards eradicate yesteryear's creative, panglossian reporting, companies will feel the effect of a low-carbon agenda on their financial bottom line. First, cash flows will change[16] as monies divert to abatement and adaptation initiatives, which hit the targets most quickly as executives' compensation becomes dependent on 'landing' the longer-term deliverables. Secondly, businesses will be forced to review their principles in view of the looming ecological crisis, which would make today's financial problems insignificant.[17] Thirdly, their mitigation strategy will influence their investment strategy as emission standards tighten and product demand becomes affected by more educated consumers who, having cast aside their rubber wrist bands, realise that the carbon-related costs do get passed through to them, and hence they will demand transparency.

MAKING IT HAPPEN

As the incentives and fines change the thinking of corporate strategists, now taking carbon seriously, more projects will be created to adjust the company to deliver carbon-sustainable performance. This requires people to translate regulations into delivery plans. Such skills may be found in veterans of Sarbanes–Oxley, experienced in process flows and financial control points; such people could switch to locating emission control points. Consultants may help stimulate supply and value-chain debates as to where emissions can be better controlled, reduced or removed. Similar skill-sets are available from people experienced in Total Quality (TQ) and Business Process Re-engineering in developing business cases, selecting projects on a 'must, should, could and won't' (MoSCoW) basis to allocate funding, and ranking regulatory and mandatory projects before discretionary ones. The projected emission promises will then be tracked for the years needed to fulfil that promised 'value'.

Once the sceptical board reviews the scenarios and selects the plan to meet or exceed the set targets and so avoid the fines, the board members will be staking their future remuneration on a project team assembled to deliver the benefits promised in those plans. If the future scenario appears to be one of high regulation then those projects will be prioritised. As Wayne Gretzky has said, the key to winning is getting first to where the puck [ball] is going next.[18] One way to fast-track the skills needed to speed up

10. DEFRA (2006), *Environmental Key Performance Indicators Reporting Guidelines for UK Business*, <http://www.defra.gov.uk/ENVIRONMENT/business/envrp/pdf/envkpi-guidelines.pdf> accessed 11 January 2009.

11. KPMG LLP UK (2008), *Step By Step: A Guide to the Carbon Commitment 2008*, <http://www.kpmg.co.uk/pubs/StepbyStep.pdf> accessed 2 January 2009.

12. The Times. (2009) 'Tea workers Still Waiting to Reap Fairtrade Benefits', 2 January. <http://www.timesonline.co.uk/tol/news/uk/article5429888.ece>.

13. Pachauri, R.K and Reisinger, A. (eds) (2007), *Climate Change 2007: Synthesis Report*. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (Geneva: IPCC). <http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf> accessed 9 January 2009.

14. Charter, D. and Smith, L., 'Green Lobby Cry Foul as Biggest Polluters Get More Time to Clean Up: Summit Criticised as Missed Opportunity for Giving Heavy Industry Concessions Over Carbon Emissions', *The Times,* 13 December, <http://www.timesonline.co.uk/tol/news/environment/article5333514.ece> accessed 9 January 2009.

15. Gillard M. and Olden, M. (2009), 'EU Denounces Socialite's Carbon Offset Project', *The Sunday Times*, 4 January, <http://www.timesonline.co.uk/tol/news/environment/article5439366.ece>.

16. Brinkman, M., Hoffman, N. and Oppenheim, J. (2008), 'How Climate Change Could Affect Corporate Valuations', *The McKinsey Quarterly*, October.

17. Joshi. S. (2008), *Companies with Solutions that the World Needs: Sustainability as a Driver for Innovation and Profit* (WWF and Confederation of Indian Industry-ITC), <http://assets.wwfindia.org/downloads/indian_companies.pdf> accessed 11 January 2009.

18. Christensen, C. M., Raynor, M. and Verlinden, M. (2001), 'Skate to Where the Money Will Be', *Harvard Business Review* , 79/10.

the idea-to-execution cycle would be to collaborate with 'outsiders' and influential pioneers, to obtain the skills and knowledge by expanding networks of ad hoc advisers or by joining forums for sharing. Time will also be dedicated to lobbying government by joining with other like-minded companies, such as the London Climate Change Partnership or the 3C initiative,[19] with an aim of achieving realistic expectations about, and implementation of, new regulations.

Companies will seek the skills, edgy attitude and unconventional thinking of internal corporate intrapreneurs: these black sheep and malcontents need to be nurtured, as they will kick-start the creation and delivery of the required business models and realise the 'cradle-to-cradle' production concept through re-manufacturing or increasing the longevity of products. Cross-company secondments for initiatives such as the EU's Project Atlantis, which looks at the business response to the growing likelihood of an elevation of sea level in London, will target such people. The type of personality that would embody such a skill set has been analysed by SustainAbility.[20]

Today's Corporate Social Responsibility (CSR) department will see its remit broaden from doing good in the community to owning the environmental agenda and determining what the New Economics Foundation calls social return on investment,[21] which aims to capture the social and environmental benefits of projects and programmes not currently captured by conventional financial returns.

BEING INNOVATIVE

Having created the support structure to facilitate innovation, de Geus reminds us that companies do not innovate – people do.[22] Strategic advisers, who assess the key challenges and impacts on business in moving away from high carbon dependency, also need to consider how to make the business more resilient to the challenges it will face. Pinpointing where value is at risk makes guaranteeing the selection of the right initiatives, in the face of the Rumsfeldian oxymoron of 'known unknowns', inexact, and the challenge transcends even a Big 5 Consultancy's current knowledge capital on future-proofing. Copying other companies' initiatives is one tactic, and is the most prevalent way of developing.[23] Training from companies such as What if![24] or reading articles from design companies such as IDEO[25] can initiate innovation, as can using Business Schools such as Ashridge and Harvard, which will consult to innovate in the company's context, or studying the work of master-guru Edward de Bono or the populist consultancy thinking that comes with a tool kit such as Blue Ocean Strategy.[26]

Research suggests that ideas are best stimulated by creating networks of people to gain from collaboration and the different perspectives.[27] Joining forces with an organisation such as Forum for the Future would bring employees into contact with new ideas and stimulus.[28] Schwartz[29] recommended establishing an initial group, for example The London Accord, including key decision makers and outsiders, to work on scenarios for the future.[30] In the case of climate change, such a group might consider a business impact scenario for each 1°C incremental increase in temperature,[31] taking into account the effect on the firm's location, workforce, customer base, product development, processing, raw materials, security and governance, risks and opportunities, and flushing out reactive opportunities in scenarios such as changes in national borders as some governments become seen as most capable of dealing with migrating populations and food shortages.[32]

If innovation is defined as the successful outcome of the application stage of the creative process, then knowledge is fundamental. A business must understand how to become more resilient, and there are several Web-based sources of data and tool kits to help frame the climate change problem and define it further in relation to its specific situation. Financial institutions can access the International Finance Corporation's climate change tools

19. Combat Climate Change (2008), <http://www.combatclimatechange.org/www/ccc_org/ccc_org/224546home/718358signa/718486signa/index.jsp> accessed 9 January 2009.

20. SustainAbility (2008), *The Social Intrapreneur: A Field Guide for Corporate Changemakers*, <http://www.sustainability.com/researchandadvocacy/reports_article.asp?id=1457> accessed 9 January 2009.

21. New Economics Foundation, <http://www.neweconomics.org/gen/newways_socialreturn.aspx> accessed 10 January 2009.

22. Geus, A. de (1999), *The Living Company: Growth, Learning and Longevity in Business* (London: Nicholas Brealey).

23. Crumley, H. (2008), *Generating Social Innovation: How to Innovate: The Tools for Social Innovation.* <http://www.youngfoundation.org.uk> accessed 9 January 2009.

24. What If Innovation, <http://www.whatifinnovation.com/Building_Innovation_Capability> accessed 10 January 2009.

25. Brown, T. (2008), 'Design Thinking', *Harvard Business Review*, June.

26. <http://www.blueoceanstrategy.com/about.whatis.html> accessed 9 January 2009.

27. Cross, R. (2007) in Hardagon, A., Parise, S. and Thomas, R. J. (eds) *Together We Innovate* (Accenture), <http://www.accenture.com/Global/Research_and_Insights/Institute_For_High_Performance_Business/By_Publication_Type/Bylined_Articles/TogetherWeInnovate.htm> accessed 7 January 2009.

28. <http://www.forumforthefuture.org> accessed 9 January 2009

29. Schwartz, P. (1996), *The Art of the Long View* (Doubleday).

30. <http://www.london-accord.co.uk>, accessed 9 January 2009.

31. Lynas, M. (2007), *Six Degrees: Our Future on a Hotter Planet* (London: Harper Collins).

32. Meyer, L. (2008), *Synthesis Report of IPCC's Fourth Assessment: Key Findings,* Presentation at the Global Roundtable on Climate Change at the Earth Institute at Columbia University, February 12–13, <http://www.earthinstitute.columbia.edu/grocc/conferences/2008/winter/presentations.html> accessed 9 January 2009.

on the Web.[33] These tools have a methodology for the measurement of portfolio GHG emissions and assist in building analytical capacity to give a better understanding of the impact of climate change on a business's activities. Others include the United Nations Framework Convention on Climate Change.[34] The World Bank is developing tools to help practitioners bring climate risk management into the managerial mainstream, as well as identifying mitigation methodologies and options such as the Greenhouse Gas Analysis tools[35] and the Pew Centre on Global Climate Change's carbon calculator.

After the generation of ideas come fostering acceptance and removing the barriers to change. People do not inherently resist change but if they feel it is pointless, or is dictated from above, they will not like it and struggle to learn to live with it. Communicating the 'why' of change helps people understand the need for it and engenders motivation by promoting the belief that it is important, and that it is going to make their life better. Communicating frequently and in simple messages can also undermine cynics and self-serving resisters, reinforcing the momentum and converting the neutral people.

Entering a competition could also galvanise the company around the carbon agenda; for instance, the Carbon Challenge.[36] This may mobilise people into action. The World Bank's competition, commencing in January 2009, on Climate Change Adaptation,[37] follows last year's 'Global Development Marketplace on Sustainable Agriculture for Development' competition, in which none of the 1768 proposals came from Europe.

Driving a project through to implementation to realise the promised benefits will require upskilling of staff. This can be done through training, for example, in the methods of PRINCE2, or by recruiting talent versed in a Big 5 implementation methodology, such as Accenture's Business Integration Method. Recruitment should seek out those who have travelled extensively, especially as one reason why the Bush Administration failed to grasp the climate and environmental agendas was a lack of international understanding.

PROVE IT!

Companies should shout about their green activities, they should inform, educate and share. The claims must, however, be true. What one would not want is for Greenpeace to arrive at head office and present an Emerald Paintbrush award, as happened to BP in 2008 for their claims about their investments in renewables.[38]

Likewise, one would not want one's new products to feature on the treehugger website in '9 "Green" Gadgets of Questionable Repute', where claims of 'greenness' are ruthlessly assessed.[39]

The media have been quick to find chinks in claimed benefits, such as by highlighting the issue of disposal of the mercury in low-energy light bulbs.[40] As companies receive negative press by being associated with causing climate change, or overstating their expected emission returns, then their value will be negatively affected.

The trustees' mission would be to make a global picture – like www.breathingearth.net – accurate.

CONCLUSION

Everything business does today will have to be done differently in future, so that the economic risks of shifting to a low-carbon economy are mitigated by good policy and international collaboration, facilitating enterprise dynamism rather than shuffling carbon obligations around the globe. This calls for an accurate and honest global measurement method and an oversight body to prioritise supply-chain-wide actions that have the greatest impact on the 2050 CO_2 emissions target. Shareholder value can then be realistically assessed to prevent a repeat of the recently experienced economic disconnect between value and share price. A changing world demands new business models that will prevent future generations from blaming us for betting on the wrong horses.

Every generation
Blames the one before
And all of their frustrations
Come beating on your door

MIKE AND THE MECHANICS: 'IN THE LIVING YEARS':

33. International Finance Corporation. *Climate change tools for financial institutions*, <http://www.ifc.org/ifcext/sustainability.nsf/Content/ClimateChange> accessed 9 January 2009.

34. <http://unfcc.int> accessed 9 January 2009.

35. *Worldbank Toolkits*, 'Greenhouse gas analysis tools', <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTCC/0,,contentMDK:20484489~menuPK:1172665~pagePK:148956~piPK:216618~theSitePK:407864,00.html#ghg> accessed 9 January 2009.

36. <http://www.englishpartnerships.co.uk/carbonchallenge.htm> accessed 9 January 2009

37. <http://web.worldbank.org/WBSITE/EXTERNAL/OPPORTUNITIES/GRANTS/DEVMARKETPLACE/0,,contentMDK:22055086~pagePK:180691~piPK:174492~theSitePK:205098,00.html> accessed 9 January 2009.

38. <http://www.greenpeace.org.uk/blog/climate/bps-wins-coveted-emerald-paintbrush-award-worst-greenwash-2008-20081218> accessed 9 January 2009.

39. Tree Hugger, 'Green Gadgets of Questionable Repute', <http://www.treehugger.com/files/2008/12/9-green-gadgets-of-questionable-repute.php?daylife=1> accessed 9 January 2009.

40. BBC News, <http://news.bbc.co.uk/1/low/uk/7172662.stm>, 5 January, 2009.

The Strategic Window of Sustainability

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INTRODUCTION

Sustainable development has arrived at a defining moment. While policy measures such as carbon taxes and emissions trading are important, these instruments alone will not create a sustainable world. We need new ideas to find long-term, systemic solutions to the underlying causes of climate change. John Ehrenfeld, a pioneer in the field of industrial ecology, writes: 'Sustainability and unsustainability are not just two sides of the same coin... Reducing unsustainability, although critical, does not and will not create sustainability'.[1]

This, then, is the key issue of the moment: the business community needs to shift its focus away from reducing unsustainability towards creating sustainability; away from regulatory compliance and avoiding short-term risk (a reactive mindset), towards the creation of new opportunities and long-term vision (a proactive mindset). Michael Porter and Forest L. Reinhardt write that climate change is not 'solely a corporate social responsibility issue', nor is it only a problem or threat.[2] It is the biggest business opportunity of this generation: the strategic window of sustainability. The engine of this emerging proactive discourse is sustainable innovation.

This paper argues that sustainable innovation is a key instrument for creating forms of economic, social and environmental value. By definition, sustainable innovation must positively and simultaneously affect each of these three interrelated areas. I argue that this can be achieved by creating the right context for innovation; leveraging the productive potential of creative consumers; and incorporating higher levels of inter-company cooperation and collaboration. Both the causes and consequences of climate change are global, therefore the response must be global also, extending across company, industry and national borders. To this end, I propose Chesbrough's 'Open Innovation' as a readily adaptable model, uniquely suited to sustainable innovation practice.

DEFINING SUSTAINABLE VALUE

Von Stamm defines innovation as 'creativity plus implementation'.[3] In this definition, innovation comprises the idea itself and the commercialisation process of putting the idea into practice. These two components, creativity and implementation, form the structure of this paper: first, what (and where) are the new ideas? How can we enable creativity for sustainability? Secondly, how can we successfully implement these ideas? What structures and processes do we need to ensure effective delivery?

Before this, we need to take a step back. Creativity is not born in a vacuum. In contrast to the popular notion of the lone individual, reaching a 'eureka' moment of invention, ideas do not arrive from nowhere. They arise out of a specific socio-economic and political context. We can analyse the context at company, regional, industry or national level – all bear an influence on creativity. John Hunt, Professor of Organisational Behaviour at London Business School, says: 'Creativity is relating a concept to a particular body of knowledge. The existing body of knowledge is as vital as the novel idea'.[4] Therefore, the prevalent interests and values are part of the context within which innovation takes place, and will influence the new ideas that are formed within that context.

Sustainable development frameworks, such as 'Natural Capitalism' and 'The Natural Step', attempt to create the right context for sustainable innovation practice in business. These models dismantle the traditional distinction between economics and ecology, so that environmental (and social) forms of value are included on the balance sheet. For example, the environmental cost of a forest cleared for factory development is no longer treated as a 'negative externality'.

For management, it is useful to understand the debate between neoclassical and ecological economic theory, but more important to comprehend the 'systems thinking' approach of these sustainability frameworks. Nigel Roome

1. Ehrenfeld, John R. (2008), *Sustainability by Design* (Yale University Press).

2. Porter, Michael E. and Reinhardt, Forest L. (2007), 'Grist: A Strategic Approach to Climate', *Harvard Business Review*, October.

3. Stamm, Bettina von (2003), *Managing Innovation, Design and Creativity* (John Wiley & Sons).

4. Quoted in ibid.

argues that most management theory, even Freeman's stakeholder theory, places managers and companies at the centre of their world, instead of highlighting the complexity of their relationships and the contexts they operate in.[5] A systems perspective requires the individual (or company) to see the whole system. The individual (or company) is one part of an interdependent network, and not at its centre: this is the starting point for building collaborative understanding and long-term, transformative innovation.

Companies – and business schools – have a responsibility to develop a practical and intellectual context which recognises the deep-rooted interconnections between social, environmental and economic prosperity: the holistic value system of sustainability. If companies and institutions fail to provide this context – the right 'existing body of knowledge' – the creative ideas arising from it will always reflect this imbalance and hence will not be truly sustainable.

DEVELOPING SUSTAINABLE CREATIVITY

Sustainable solutions range across multiple industries, categories and levels of innovation. Porter and Reinhardt write that there is no 'one-size-fits-all' approach to sustainability: it must connect with each company's particular business and overall strategy.[6] There will be innovation based on lower-carbon or renewable energies for power, heat and transport (such as solar power, electric cars); innovation to decrease non-energy emissions (such as methane from livestock, deforestation); innovation to increase energy-use efficiency (such as energy meters, data server coolers); and innovation to create less-emissions-intensive goods and services (for instance, reducing use of paper and PVC).[7]

Amid the diversity, three underlying trends of sustainability are dematerialisation, localisation and servicisation. These trends do not apply to all forms of sustainable innovation, but they inform many of the best ideas – particularly in the areas of efficiency and development of new goods and services.

Dematerialisation is the process of reducing the use of materials (and energy) from a product or service. This includes changing products from physical to non-physical form (books to e-books) and developing devices with multiple uses (a smart phone is also an audio player, camera, etc.). Many products – such as a car – are resolutely physical and cannot be turned into non-physical form. In these cases, dematerialisation involves doing more with less. For example, leasing arrangements (car sharing instead of ownership) and extending the useful life of products. In both instances, overall materials and energy use are reduced.

Localisation focuses on reducing energy and emissions from transport. This involves eliminating unnecessary human travel (telepresence and videoconferencing) and reducing goods transportation (locally grown rather than imported food). Localisation also involves the efficiency gains of physical proximity, for example in industrial parks (Kalundborg, Denmark) and in cities (high density 'smart living' in Vancouver). New ways of increasing urban density make it easier to share resources and reduce waste. Every week 1.3 million people arrive in the cities of the world – and urbanisation is set to continue.[8] There is a major new market for solutions that increase the sustainability of our cities, in developed and developing worlds.

Servicisation involves moving from the traditional manufacturing model of selling products to providing services. It often includes business model innovation and has a profound effect on the way a company creates value. Amory Lovins gives the example of moving to a service-based model for lighting as 'providing illumination' rather than 'selling lightbulbs'.[9] This has two effects: first, altering the frame of reference (away from equipment to function) opens new opportunities for delivering the value to the consumer; secondly, the wider definition of 'providing illumination' initiates a systems approach that focuses on the fundamental solution required, rather than the symptomatic solution, with its unwanted environmental side effects. A service model encourages the company to take full life-cycle responsibility, which in turn provides incentives for increased resource productivity and waste avoidance.

Interface's Evergreen Lease programme changed the firm's business model from 'selling carpets' to 'leasing floor-covering services'. For a monthly fee, Interface accept full responsibility for the carpet, including installation, renovations and end-of-life responsibility, where the carpet is repurposed and diverted from landfill. The leasing model creates major savings: when these are calculated together with those made by using solenium (Interface's recyclable flooring material) there is a net reduction in materials and embodied energy of 97%.[10] Therefore, the services model aligns the interests of the client and producer: the client receives better service at a lower price and the producer's profit margin is increased through doing more with less. Further, the service model is relationship-based rather than transaction-based. With shorter product life cycles and increased global competition, building a client relationship is a powerful form of competitive advantage.

Building relationships is also important for ideas generation. In the information economy, knowledge is distributed through networks of organisations, institutions and industries. For both large corporations and start-ups,

5. Roome, Nigel (2009), *Heliocentrism, Evolution, the Credit Crisis and Climate Change*, EABIS Working Paper, <http://www.eabis.org/knowledge-sharing/working-papers-3.html>.

6. Porter, Michael E. and Reinhardt, Forest L. (2007), Grist: A Strategic Approach to Climate, *Harvard Business Review*, October.

7. Stern, N. (2006), *Stern Review: The Economics of Climate Change* (HM Treasury).

8. Brand, Stewart (2006), 'City Planet', *Strategy & Business*, Spring.

9. Lovins, Amory B; Lovins, L. Hunter and Hawken, Paul (1999), *Natural Capitalism: Creating the Next Industrial Revolution* (Little, Brown and Company).

10. Ibid.

the situation is the same: the amount of knowledge available outside the company exceeds the knowledge held internally. Therefore, it is sensible to adopt structures and mechanisms that allow ideas to flow into (and out of) the firm. Beyond the company's conventional boundaries are ideas generated by other companies and consumers.

The new ideas are everywhere: supply chain partners, start-ups, universities. Increasingly, the most fertile place for innovation is at the borders between fields, disciplines and industries, where two areas of specialist knowledge combine to create new synergies. Companies that position themselves at these intersections and embrace this diversity will generate the most valuable ideas.

Consumers are collaborators too. In an information-rich, connected world, the traditional distinction between producer and consumer is dismantled. For example, the mountain bike (a market today worth over 55 billion dollars) was not created in an R&D lab, but by proactive consumers.[11] Similarly, even when technology is developed in-house, the real value of the innovation is defined 'in-use' with consumers. Mobile operators did not understand the value of SMS messaging technology (today worth over 90 billion dollars) until this form of communication was discovered and developed by teenagers. The new landscape of active user participation is a tremendous source of energy and ideas.

If a modern company leverages the creativity of users – and other companies – it dramatically increases its productive resources for innovation. Further, there is lasting competitive advantage in building close relationships with companies and consumers. If a firm develops a meaningful dialogue with users during the innovation process, it creates a powerful authentic connection between brand and consumer. Companies build brand value by skilfully managing this two-way flow of information.

A final point on creativity and, perhaps, the most important. Our creative ideas for sustainability should include – even prioritise – the developing countries of the world. Most emissions increases in the next 50 years will come from these fast-growing economies, therefore they are major markets for sustainable innovation. In these economies, there is the opportunity to develop infrastructure from the ground up. This allows for a 'whole system' perspective from the start, which allows for bigger emissions savings. Curitiba in Brazil, one of the world's most sustainable cities, shows that the biggest gains are achieved when innovation is systemic.

IMPLEMENTING SUSTAINABLE INNOVATION

Von Stamm's classification system for innovation combines the category (product; service; process; business model) and degree of novelty (incremental; radical; discontinuous).[12] Incremental innovation can usually be copied by competitors and differential advantage is quickly cancelled out. Therefore, lasting competitive advantage is achieved through radical innovation and/or innovation at a number of levels simultaneously – ideally, including business model innovation.

Sustainable innovation follows the same principle. Interface achieved dramatic results by implementing simultaneous change at product, process and business model level. Similarly, Apple's iTunes transformed the delivery of recorded music through innovation at each category level. Apple created sustainable value by aligning their offering with major sustainability trends: at product/service level, Apple dematerialised music from physical format (records/CDs) to non-physical (mp3s); at process level, digital delivery reduced energy and transport emissions; at business model level, Apple created a new (legal) online music market and positioned iTunes as a music download service. Much discussion on recorded music focuses on digital piracy, but we should not ignore this important lesson: the entire industry was transformed through one company's multi-level innovation strategy based on servicisation and dematerialisation.

The issue facing us is that radical innovation, as demonstrated by Apple and Interface, is rare. The majority of modern business activity is driven by short-term goals and rapid return on investment. Incremental innovation is often commercially preferable for a firm because it is a lower-risk proposition: simply modify existing products for existing customers through existing channels. This perspective can be prevalent in large organisations, with high sunk costs and a preference for minimising disruption to its profitable current model.

But the scale of the threat of climate change and the criticality of a fast response demands that sustainable innovation is radical innovation. Incremental innovation is valid, and will be part of a balanced R&D portfolio, but without transformative improvements, we will not meet the climate challenge quickly enough. The implementation of radical ideas involves higher levels of uncertainty and, therefore, risk. The question quickly moves to how we can mitigate this risk.

11. Leadbeater, Charles (2005), 'Design Your Own Revolution', *The Observer*, 19 June.

12. Stamm, Bettina von (2003), *Managing Innovation, Design and Creativity* (John Wiley & Sons).

Henry Chesbrough's Open Innovation model is based upon increasing the flow of knowledge into and out of the company in order to accelerate internal and external innovation.[13] It is the opposite of closed innovation, where R&D is a centralised, internal process within each firm. In closed innovation, the individual company does everything itself and intellectual property (IP) is a mechanism to prevent competitors from benefiting from the innovation. In contrast, Open Innovation recognises the importance of the business ecosystems in which firms operate and the diffuse distribution of knowledge. Firms buy in IP from outside if required and monetise their own IP through licensing it to external firms. For example, in Procter and Gamble's 'Connect and Develop' initiative, if ideas created in the company's labs are not used internally after three years, they become available to other companies.

One of the principles of sustainability is to model business processes on designs inspired by nature. It is possible to see Open Innovation as a nature-inspired 'closed-loop' model, where every idea is an output: it can be either commercialised by the firm itself, or become an input for another company's innovation process. The number of wasted ideas is reduced. Also, the increased interactions between companies deepens their understanding of interdependence within the business ecosystem.

Open Innovation reduces the risk from radical sustainable innovation through its innately decentralised, diversified structure. Companies leverage the assets of the wider network. The increased flow of information into the company provides a larger number of potentially game-changing new ideas. The increased flow of information out of the firm allows the firm's technology to be applied in new markets and in combination with different business models. As the value of the innovation is discovered 'in-use', testing in a larger number of different 'in-use' contexts maximises the potential for positive results. Innovation becomes a collective activity. Effectively, we reduce the risk by sharing it.

The Open and Closed Innovation paradigms should not be seen as absolutes, rather as opposite positions on a continuum. Increasingly, companies will combine elements of the open and closed models to suit their particular business situation and strategy. The management skill lies in adapting or configuring the principles of Open Innovation to a particular context in order to maximise value creation. Every company that incorporates these principles will contribute to the 'greater co-ordination and enhanced linkages' of business, as recommended in the Stern Review.[14]

CONCLUSION

It is often the case that innovation fails not at the creativity stage, but during implementation. Bringing innovation to uncertain markets is a complex process and a major challenge for management. Therefore, alongside creativity, we need to find the right mechanisms and structures that ensure successful implementation. In this paper, I have presented Open Innovation as a model whereby new forms of collective action may reduce the risk from implementing-low carbon ideas. Governments can allocate incentives – and consumers co-create – but it is the responsibility of business to implement the transformative ideas of the new economy.

The strategic window of sustainability is unique. It differs from the limited periods of opportunity described in Derek Abell's essay about timing strategy to 'fit' the wider marketing environment.[15] Failure to invest and innovate in sustainability practices carries a higher price than lost profits or market share. This is about the relationship of business with its environment, in the widest, most important sense. Either side of this unique strategic window is a wall that symbolises the end of modernity's economic progress and a concrete failure of human potential. But through this window, out on the other side, is a flourishing world of open possibility.

13. Chesbrough, Henry William (2003), *Open Innovation: The New Imperative for Creating and Profiting from Technology* (Harvard Business School Press).

14. Stern, N. (2006), *Stern Review: The Economics of Climate Change* (HM Treasury).

15. Abell, Derek F. (1998), 'Strategic Windows', *Journal of Marketing*, July.

About the Organisers

ASHRIDGE

Ashridge is one of the world's leading business schools, being ranked number one in the UK for the third year running in the 2009 Financial Times rankings for tailored executive education. It is one of a handful of schools in the world to be accredited by the Association to Advance Collegiate Schools of Business (AACSB); the European Quality Improvement System (EQUIS) and the Association of MBAs (AMBA).

Ashridge's activities include open and tailored executive education programmes, MBA, MSc and Diploma qualifications, organisation consulting, applied research and online learning. Ashridge is an international authority on the changing relations between business, government and society. Its research and thought leadership has played a key role in debates over responsible and sustainable business for more than a decade.

www.ashridge.org.uk

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Established in 2002 by leading companies and business schools in partnership with the European Commission, EABIS aims to integrate corporate responsibility into the mainstream of business theory and practice in Europe. EABIS funds collaborative research, education and training projects and hosts numerous events and workshops across Europe to develop more and better knowledge and learning on corporate responsibility. With a European focus and a global outlook, membership of EABIS currently numbers over 100 institutions and includes some of the world's largest global corporations, such as Shell, Unilever, IBM, Johnson & Johnson and Microsoft, and Europe's top business schools.

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ACCA (the Association of Chartered Certified Accountants) is the global body for professional accountants. We aim to offer business-relevant, first-choice qualifications to people of application, ability and ambition around the world who seek a rewarding career in accountancy, finance and management.

ACCA supports its 131,500 members and 362,000 students throughout their careers, providing services through a network of 80 offices and centres. Its global infrastructure means that exams and support are delivered – and reputation and influence developed – at a local level, directly benefiting stakeholders wherever they are based, or plan to move to, in pursuit of new career opportunities. ACCA's focus is on professional values, ethics, and governance, and it delivers value-added services through global accountancy partnerships, working closely with multinational and small entities to promote global standards and support.

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