

Consumers, business and climate change



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Consumers, Business and Climate Change

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A report prepared by the Sustainable Consumption Institute at The University of Manchester, UK, in collaboration with members of the CEO forum of companies

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1. EXECUTIVE SUMMARY



As consumers, our lives are based on goods, services and activities that depend on the production of greenhouse gas emissions. Taking UK emissions alone, a conservative estimate is that 75% of emissions are influenced directly or indirectly by consumers.

At the same time, much hope is being invested in international negotiations and big-ticket solutions – often led by individual countries – as a way of tackling climate change. But with emissions rising exponentially, we need solutions more quickly than governments can achieve on their own.

Consumption transcends national boundaries. Businesses serve consumers, operate globally and can work quickly. So the opportunity is there for consumers, helped by businesses, to lead a green revolution: this paper shows how it can be achieved.

THE NEED TO ACT

The threat of climate change is urgent, and the evidence about it is now unequivocal. Emissions are rising more quickly than ever, with global targets not being met. The world faces severe consequences, and we must act now to reduce the impacts.



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The rise in emissions is due to growing consumption combined with an expanding global population:

- **Consumption** is directly linked to greenhouse gas emissions through fossil fuel power generation, industrial processing and agriculture
- **Global population** is set to increase from close to 7 billion in 2009 to 9.2 billion by 2050. Although producing much lower emissions per person than developed countries, developing countries are seeking rising living and consumption standards, which will raise greenhouse gas emissions still further.

It is neither desirable socially nor possible in reality to deny countries the opportunity to develop and raise living standards. The aim must therefore be to find routes to low-carbon improvements in living standards in both developed and developing countries.

Greenhouse gas emissions build up in the atmosphere with a cumulative effect, so the pathway of reductions is just as vital as the final concentration level we reach. This means that fast action is essential – the sooner we cut our emissions, the greater the benefit.

THE ROLE OF CONSUMERS

For the reasons given above, consumers are often (rightly) seen as part of the problem. But for the same reasons they are also fundamental to the solution.

Crossing national boundaries: a consumption-based approach

The significant role played by consumers is underlined if we look at emissions not according to production but by consumption. Emissions statistics are traditionally divided by country according to where the emissions are actually produced. If we consider instead the countries in which goods and services are consumed, and allocate emissions accordingly, the findings are striking.

For example, nearly 20% of China's emissions are produced on behalf of other countries. Conversely, emissions from the US would be 8% higher when counted by consumption.



How consumers can make a difference

Attempts to reduce consumer emissions often involve trying to impose measures on people to limit their activities. But emissions reduction strategies that are imposed on people cannot realistically achieve anything like the reductions required.

Nevertheless, consumers can play a crucial and powerful role in the fight against climate change. With help and support to change their behaviour voluntarily and to seek low-carbon products and services, they can:

- Reduce emissions in the least expensive way;
- Have an immediate impact;
- Have an impact which can be sustained;
- Stimulate competition for low-carbon innovation by businesses;
- Empower governments to enact low-carbon policies.

Consumer action can achieve both improved living standards and a rapid reduction in carbon emissions – more rapid than can be achieved by governments alone.

Overcoming barriers

Surveys around the world show that consumers are willing to tackle climate change. But they face some common barriers – the availability and price of low-carbon products, lack of information, and a sense of hopelessness in the face of a huge problem.

The challenge for decision-makers is therefore to overcome these barriers and to unleash consumer and business action against climate change.

MAKING LOW-CARBON PRODUCTS AVAILABLE: INNOVATION AND THE SUPPLY CHAIN**Global supply chains**

Sources of emissions are often linked across countries and continents. The demand for a product in one country often stimulates production in another country, followed by distribution across continents and then sale, use and disposal in the country where the demand originated.

These supply chains – and the businesses that organise them – can play an important part in the battle to reduce emissions. In particular, lifecycle analysis of products and services can lead to innovation for tackling emissions “hot spots”.

The businesses involved are often international in outlook and organisation and well-equipped to play their part in this global task. Many have already begun to address climate change issues out of necessity and foresight, but there is great potential to go further.

To do this they need to be stimulated by market and consumer demand and rewarded by consumer preference.

New technologies and innovations

Consumer demand must be stimulated for low-carbon products and services, using a range of tools such as tax incentives, public procurement decisions and targeted marketing.

If we succeed in stimulating consumer demand for low-carbon products and lifestyles, businesses will respond by coming forward with new products and services, better information and marketing activity as part of the new low-carbon economy.

Given the urgency of the task, we should examine ways to accelerate this business response, and to ensure it is international in its organisation and impact. Strategies to achieve this could include:

- Understanding that business action to reduce emissions must focus on all stages in the process – primary production, manufacture, packaging, distribution, consumer use and disposal.
- Strengthening this process by developing internationally agreed measures of the carbon content and impact of products and services. Applying international accountancy standards would make the pursuit and adoption of these measures more efficient and accessible.
- Finding effective ways for businesses to collaborate on emissions reductions at all stages in the supply chain, homing in on the “hot spots”.
- Stimulating demand for low-carbon products and services through incentives and other mechanisms, without customers having to make trade-offs on performance or value.

EMPOWERING CONSUMERS

Action to tackle emissions in the supply chain is vital, but will not be enough on its own: consumers need to be empowered to choose the best products and use them effectively.

To maximise the power of consumers in tackling climate change, we need a three-part revolution:

(A) Removing individual barriers

The first step in empowering consumers is to remove the individual barriers they face when trying to make low-carbon choices:

- **Price** – providing cheaper options and incentives;
- **Information** about the impact of consumer choices on climate change;
- **Hopelessness** – individuals are not acting alone.

(B) Changing the social context

However, individual strategies are not by themselves enough. The choices we make as consumers are affected not just by the products we find in a store, but also by the cultural context in which we live. Low-carbon choices, products and actions must become the social norm by:

- Using taste-makers, early adopters and consumer champions to make low-carbon fashionable;
- Instilling low-carbon habits at work and explaining how these can be applied at home;
- Promoting carbon numeracy in schools and among the young so they can influence their households and be the low-carbon generations of the future;
- Encouraging low-carbon advocates and adopters to communicate and support each other via virtual and real low-carbon clubs and communities;
- Developing community-wide strategies to reduce carbon.

(C) Adapting the material context

Low-carbon choices must also be integrated into our lives. It is not enough simply to substitute a high-carbon product with a low-carbon one. We also need to consider the context in which the goods will be used. Goods and infrastructure are interconnected and need to evolve consistently by developing low-carbon products in conjunction with each other, and getting the infrastructure right.

Using all these strategies together will put consumers at the heart of the fight against climate change. The prize is a powerful and well-directed movement for change – a consumer-driven revolution in low-carbon consumption.

2. THE NEED TO ACT



SUMMARY

The threat of climate change is urgent, and the evidence for it is now unequivocal. Emissions are rising more quickly than ever, with global targets not being met. The world faces severe consequences, and we must act now to reduce the impacts. The rise in emissions is due to growing consumption combined with an expanding global population:

- **Consumption** is directly linked to greenhouse gas emissions through fossil fuel power generation, industrial processing and agriculture.
- **Global population** is set to increase from close to 7 billion in 2009 to 9.2 billion by 2050. Although producing much lower emissions per person than developed countries, developing countries are seeking rising living and consumption standards, which will raise greenhouse gas emissions still further.

It is neither desirable socially nor possible in reality to deny countries the opportunity to develop and raise living standards. The aim must therefore be to find routes to low-carbon improvements in living standards in both developed and developing countries. Greenhouse gas emissions build up in the atmosphere with a cumulative effect, so the pathway of reductions is just as vital as the final concentration level we reach. This means that fast action is essential – the sooner we cut our emissions, the greater the benefit.

2.1 THE THREAT OF CLIMATE CHANGE

Global warming induced by climate change is a very serious threat, perhaps the most serious that humans have ever collectively faced. But despite growing recognition of this among governments, businesses and the public, the problem is getting worse. In 2007, the United Nations Intergovernmental Panel on Climate Change (IPCC) famously produced a set of reports showing the extent to which climate change is already with us, and making disturbing predictions of the future if we fail to act (IPCC, 2007).

This was the most hard-hitting of all the IPCC's warnings, and yet, based on new data gathered since 2005, an authoritative update to the science published in March 2009 showed that many of the IPCC's 2007 predictions didn't go far enough (Richardson, Steffen et al, 2009). Carbon dioxide emissions are rising more quickly even than the average of the IPCC's worst case scenarios (see Figure 1): while the 2007 report predicted that sea levels would rise by 50cm by the end of the century, that estimate has now doubled; and in spite of the agreements made



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2.2 WHY ARE EMISSIONS RISING?

To understand why efforts to date have done so little to curb the growth in global emissions, we need to consider the core drivers of climate change: people.

First, the global population is escalating. According to the UN, by 2050 there will be 9 billion people on Earth, half as many again as there were in 2000 (see Figure 2). We therefore need to plan for a world with at least 50% more people than there are today.

Second, people are getting richer. In today's high-carbon economy, growth in GDP is tightly coupled with growth in emissions so that the richer you become, the more greenhouse gases you produce.¹ Because of this, developing nations have together overtaken the industrialised world as the main global source of greenhouse gases. The economic crisis of 2008/9 has temporarily slowed this development, but in the long run it is likely to be little more than a brief interruption in an upward spiral.

Increasing wealth isn't the only thing that makes a difference to emissions. Studies also show that demographics and lifestyle are important too. People living in cities tend to produce more emissions than those in the countryside, because on average they consume more, and the urban proportion of the world's population is predicted to rise from nearly 50% today to some 70% by 2050 (see Figure 3). The percentage of people above the age of 60 is also set to rise, and although older people themselves often produce fewer emissions, the ageing trend will also lead to more single-person households, thus increasing emissions (Minx, Baiocchi, Wiedmann and Barrett, 2009).

by the world's richest nations to reduce their emissions under the Kyoto Protocol, global emissions have continued to grow exponentially (CDIAC, 2009).

The IPCC's work also shows that some of the effects of climate change have a significant time-lag. An important example is sea-level rise: even if we were to return to pre-industrial emission levels tomorrow, sea level would continue to increase for a couple of centuries.

In July 2009, the G8 countries formally committed themselves to an ambitious climate goal: attempting to keep global temperatures from rising no more than 2°C above those of the pre-industrial era. Beyond this threshold, the chances of catastrophic change become ever more dangerous. However, if current trends continue, global temperatures could rise to more than 4°C above pre-industrial levels by the end of the century. The consequences of such a rise could be devastating, especially in developing countries (IPCC, 2007).

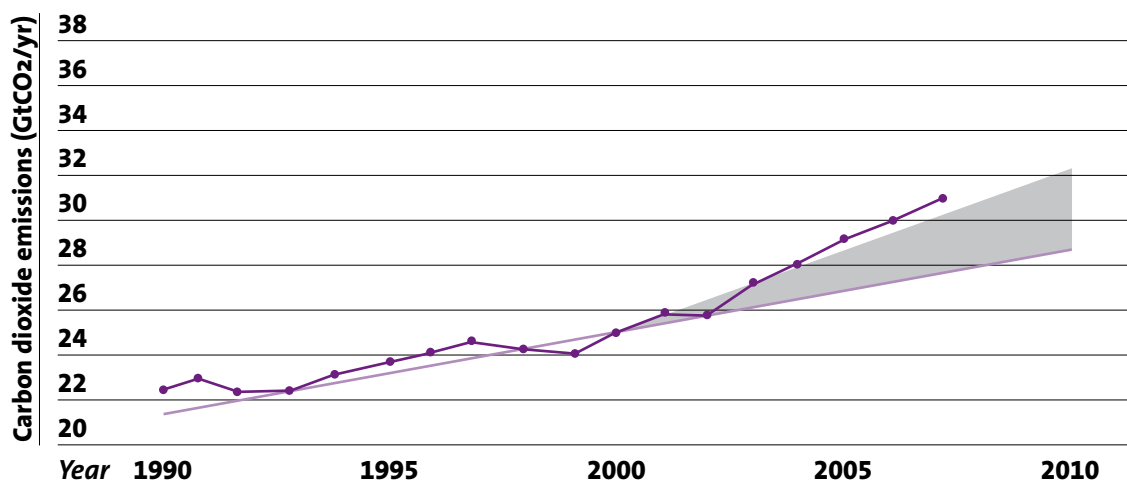


¹1% growth in GDP correlates to approx 1% growth in CO₂ emissions: Dietz and Rosa 1997 (1.15), Shi 2003 (1.43), Cole and Neumayer 2004 (0.98)

FIGURE 1:

The dotted line shows carbon dioxide emissions from the Carbon Dioxide Data Analysis Centre, which have risen above the range of averaged IPCC scenarios for future emissions, shown in grey

Data provided by Pep Canadell and Mike Raupach at CSIRO Marine and Atmospheric Research Global Carbon Project (www.globalcarbonproject.org) as an update to Raupach, Marland et al, 2007



This combination of population growth, economic development and demographic change means that people, living their lives as consumers, are driving significant and growing emissions of greenhouse gases.

If the developing world continues to emulate the high-carbon growth that the industrialised world has already followed, the very large growth in global emissions will continue. And yet it is clearly essential, as well as inevitable, that the poorer countries of the world should continue to develop. Rather than seeking to hinder that development, we need to find new, low-carbon paths for growth.

This point is crucial. Just as the growth in population and consumption has created the problem, so consumers must be part of the solution. The drive to improve lifestyles and the competition and ingenuity that flow from it need to be channelled into a dynamic new quest for low-carbon goods and services.

This paper explores how putting consumers at the heart of tackling climate change can help the industrial economies

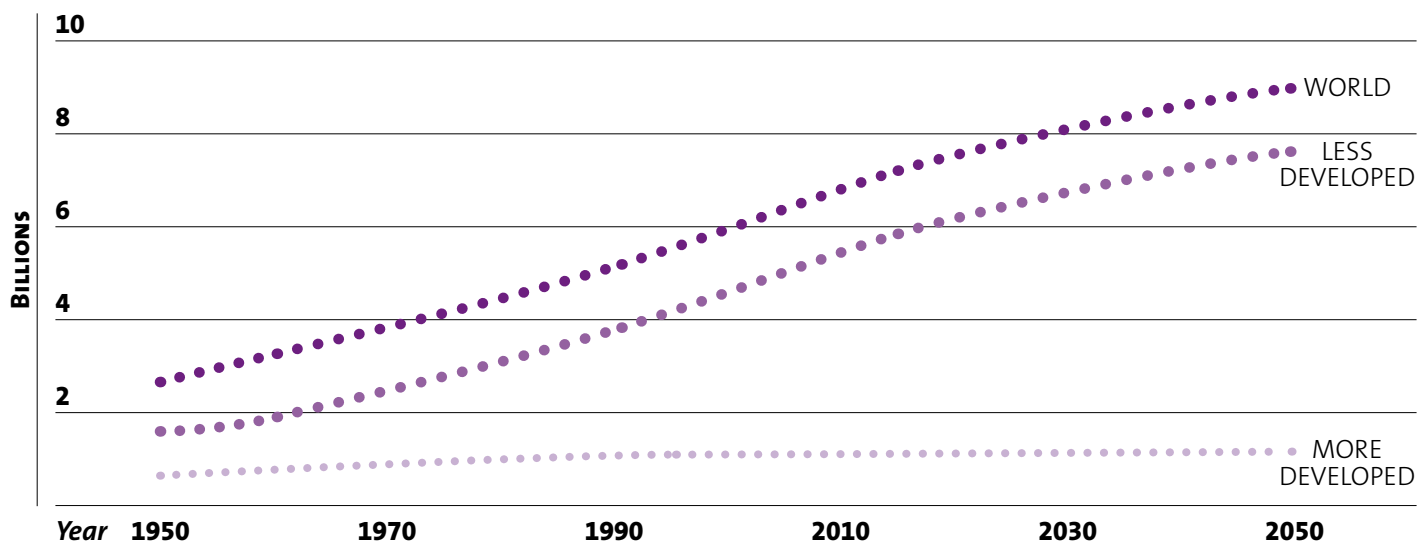
show leadership in reducing emissions, while encouraging industrialising countries to break the relationship between economic growth and rising emissions. It allows businesses to focus innovation efforts on the stages that really matter, while touching parts of the problem that the standard, production-based methods can't reach.

2.3 URGENT ACTION IS NEEDED

There is another reason why looking at emissions from the point of view of consumption can help us tackle the climate challenge: it could be much quicker than many alternatives. Many world leaders are now focusing on a long-term target of cutting global annual emissions by 50% by 2050, requiring at least an 80% reduction in developed countries as emissions in developing nations necessarily continue to rise. However, we also need to take into account the cumulative effect of the gases that will be released every day between now and 2050. Because carbon dioxide remains in the atmosphere for more than a century, the emissions path we take to 2050 matters even more than the outcome in 2050 alone. Emission

FIGURE 2:
Population projected to rise by 50% by 2050

Source: United Nations World Population Prospects: The 2008 Revision



reductions made now therefore have a cumulative benefit for the future.

This has significant consequences for how quickly we will need to act. The red line in Figure 4 shows one example of the pathway that we need to follow if we are to have any chance of keeping to the global temperature target. (The area underneath this line corresponds to enough greenhouse gases to take the concentration in the atmosphere to 450 parts per million – which would give a reasonable chance of staying below 2°C.) If over the next few years we allow emissions to rise above this (shaded purple and denoted A), we will then have to ensure that in later years they drop below the red line by an equivalent amount (shaded purple and denoted B). Note that the final level reached by the dotted line is lower than that of the red line, but the area underneath these two curves – in other words the total cumulative greenhouse emissions – is the same. This means that to have the same climate impact as the black dotted line, we would need to reduce emissions much more steeply, and reach a lower annual level.

Clearly the dotted line is much steeper than the red line. In other words, if we delay action to reduce emissions, we will have to work very much harder to stay within the climate target. This in turn could cause serious damage to the global economy. New studies show that if emissions continue to rise for the next 10 or 15 years, we will then need to reduce them by more than 3% per year to avoid ‘dangerous climate change’ (Anderson and Bows, 2008). And yet, according to

FIGURE 3:
Key global demographic trends

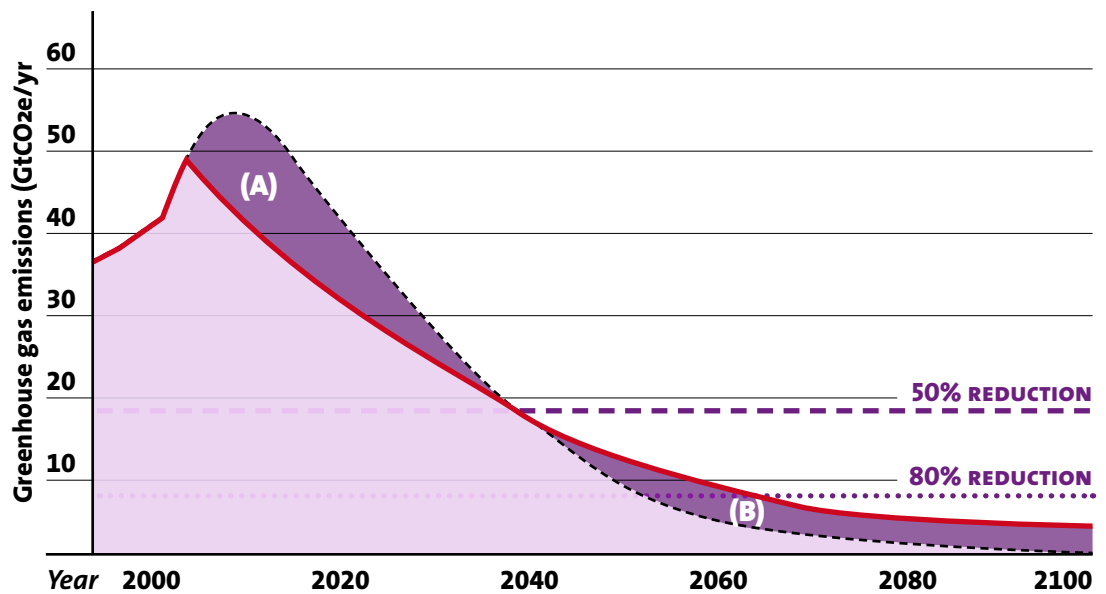
KEY GLOBAL DEMOGRAPHIC TRENDS 2005-2050		
	(BILLIONS OF PEOPLE)	
	2005	2050
Urban (Billion) (%)	3.3 (48%)	6.4 (70%)
Developed	1.0	1.1
Developing	2.3	5.3
Elderly (60+ Billion) (%)	0.67 (10%)	2.0 (22%)
Developed	0.24	0.4
Developing	0.43	1.6

Data Sources: UNPD. UN Population Prospects 2006 Revision; UN Urbanization Prospects 2007 Revision



FIGURE 4:
The red line illustrates a pathway commensurate with the 2°C target

The illustration is adapted from data published in (Anderson and Bows, 2008)



the Stern Review, emission reductions of more than 1% per year have only occurred to date because of economic recession or upheaval (Stern, 2006). Compounding this issue, emissions in developing countries continue to link strongly with economic growth and are increasing at high rates, placing further onus on developed nations, with lower emission growth and higher consumer emissions, to act urgently.

Another problem with delaying action is that the more emissions rise, the higher the risk of unforeseen, but catastrophic change (Lenton et al, 2008). The climate system is complex, models are imperfect, and nobody can be sure that we have covered all our climate bases. For example, it is not yet clear at what point the vulnerable ice sheets on Greenland and West Antarctica might collapse, sending sea levels surging. Nor do we know when melting of the northern permafrost would start to release enough buried carbon to dwarf human emissions and put the climate problem beyond the bounds of any human solutions.

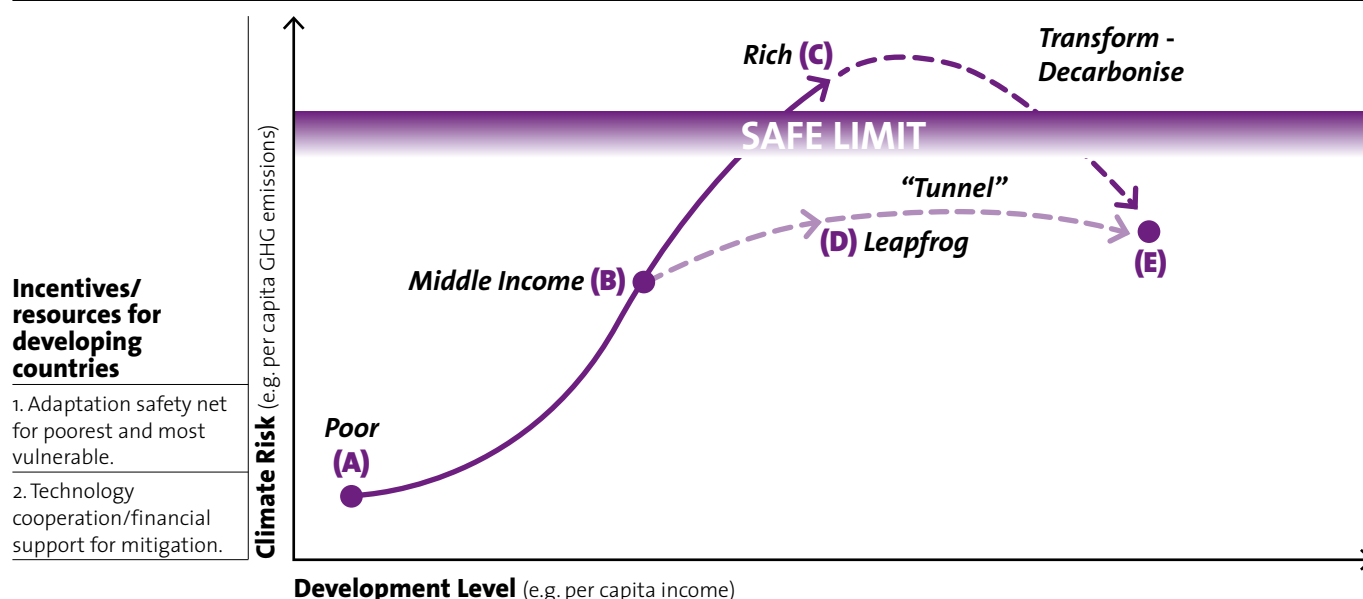
In considering global responses to climate change, a vital factor is that most of the excess greenhouse gases already in the atmosphere are there as a result of past activity in the developed world. The impacts, however, are being felt most dramatically in the developing world.

As the 2007 IPCC report pointed out, climate change policies therefore need to be fully integrated into sustainable development strategy. This is because of the two-way linkage between climate and development – it is the emissions from development that will shape future climate change, and in turn, the impacts of climate change will affect future development. Sustainable consumption could play a critical role in reconciling development aspirations with climate policies.

Figure 5 shows the key elements of a long-term consensus that could evolve at the Copenhagen Climate Summit (COP15) and beyond (Munasinghe, 2007). On this stylized curve of environmental risk against a country's level of development, poor nations are at point A (low greenhouse gas emissions and low GNP

FIGURE 5:
Developing countries can “tunnel” to avoid the carbon-intensive growth path of rich countries

Source: Munasinghe, 1995



per capita), rich nations are at point C (high greenhouse gas emissions and high GNP per capita), and intermediate countries are at point B.

The principle of “making development more sustainable” requires full integration of climate change policies (mitigation and adaptation) into sustainable development strategy (Munasinghe, 2007). It underlies both the proposed developed country path CE (transform-decarbonise) and the developing country path BDE (tunnel-leapfrog). More sustainable consumption is essential to achieve the objective of reducing emissions within a sustainable development strategy. There are grounds for optimism because many examples of such best practice already exist around the world, which could be readily replicated elsewhere.

As we have seen, global emissions need to reach a peak and start to fall as soon as possible. Short-term changes matter at least as much as longer-term ones. Large-scale infrastructure projects such as new power stations will help to decarbonise our energy supply, but most will not be deployed in the next few years. On the

other hand, behavioural changes made by large numbers of consumers could happen very quickly, as could both radical and incremental innovations by large numbers of manufacturers. Consumer-based strategies that generate emissions reductions today will be essential to bolster efforts and offset risks in the longer-term strategies as we move towards a low-carbon future.

Recent research has demonstrated that UK consumers control or influence 75% of national emissions (Barrett et al, 2009). As will be shown in later sections, this is perhaps a conservative estimate – the figure is arguably nearer 100%, as a majority of emissions relate to activities, products or services benefiting consumers.

The message from science is clear. Consumers and those that serve them should not just be seen as part of the problem; rather they can be a major part of the solution. The rest of this paper discusses the many ways that consumers can help provide the immediate and effective shifts that we will need in order to tackle climate change.

3. THE ROLE OF CONSUMERS



Many existing strategies to tackle climate change see consumers only as part of the problem. Some envisage bypassing the consumer, for example through technological innovations that reduce emissions regardless of what individuals do. Others attempt to impose measures on consumers for reducing their emissions – through top-down regulation, taxation

and prohibition. However, if they are used in isolation, such strategies will have limited impact.

Consumers are the key to the widespread behavioural shifts needed. As well as reducing emissions in their own activities, they can encourage innovation in businesses by demanding low-carbon



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products and services, and can bolster the efforts of politicians to take radical steps towards a lower carbon world. Thus, both businesses and political leaders need to engage with consumers not simply as emitters of carbon but as potentially positive drivers of change.

SUMMARY

The significant role played by consumers is underlined if we look at emissions not according to production but by consumption. Emissions statistics are traditionally divided by country according to where the emissions are actually produced. If we consider instead the countries in which goods and services are consumed, and allocate emissions accordingly, the findings are striking. For example, nearly 20% of China's emissions are produced on behalf of other countries. Conversely, emissions from the US would be 8% higher when counted by consumption.

Attempts to reduce consumer emissions often involve trying to impose measures on people to limit their activities. But emissions reduction strategies that are imposed on people cannot realistically achieve anything like the reductions required.

Nevertheless, consumers can play a crucial and powerful role in the fight against climate change. With help and support to change their behaviour voluntarily and to seek low-carbon products and services, they can:

- Reduce emissions in the least expensive way;
- Have an immediate impact;
- Have an impact which can be sustained;
- Stimulate competition for low-carbon innovation by businesses;
- Empower governments to enact low-carbon policies.

Consumer action can achieve both improved living standards and a rapid reduction in carbon emissions – more rapid than can be achieved by governments alone.

Surveys around the world show that consumers are willing to tackle climate change. But they face some common barriers – the availability and price of low-carbon products, lack of information, and a sense of hopelessness in the face of a huge problem.

The challenge for decision-makers is therefore to overcome these barriers and to unleash consumer and business action against climate change.



3.1 CROSSING NATIONAL BOUNDARIES: A CONSUMPTION-BASED APPROACH

The official system by which countries account for their greenhouse gas emissions sums up all the emissions produced within a nation's borders. This production-based view is important and should continue to be the major basis on which governments negotiate a global political deal at the end of 2009 at the key UN meeting in Copenhagen. Production-based accounting is pragmatic, since the major international unit of governance is the nation-state, and there are considerable practical advantages in being able to measure emissions directly from the smoke-stack or tail-pipe where they occur.

However, a consumption-based view would tell a rather different story. This is because greenhouse gases are often released in one country to produce goods and services that are then consumed in another. Figure 6 shows a map of the world in which the size of each country has been morphed to account for its total consumer emissions.

In this picture just four territories – the US, EU, China and India – account for 46% of global emissions. However, this is not the whole story. The colour of each country shows its consumption-based emissions per person. On this basis, it is clear that the only reason India and China are sizeable on the map is because of their extremely large populations. The US, Canada, Australia, Netherlands and Belgium have the highest per capita consumer emissions, closely followed by most of the remaining countries in the EU. The industrialised world has outsourced much of its production to rapidly developing countries, while shifting the associated emissions off their balance sheets. This problem is exacerbated because rapidly developing countries tend to produce

goods with lower energy efficiency – and higher related emissions – than their industrialised counterparts (Wiedmann et al, 2007). In other words, shifting production from the industrialised to the developing world significantly increases global emissions.

Figure 7 shows the difference between territorial (production-based) and consumer-based emissions for the 13 highest emitting countries. This reveals some startling changes. For example, if a consumer-based accounting system were in place, Japan's emissions would be 26% higher. Not quite as extreme, but still significant, are Italy, UK and Germany, all of which benefit significantly from production-based accounting.

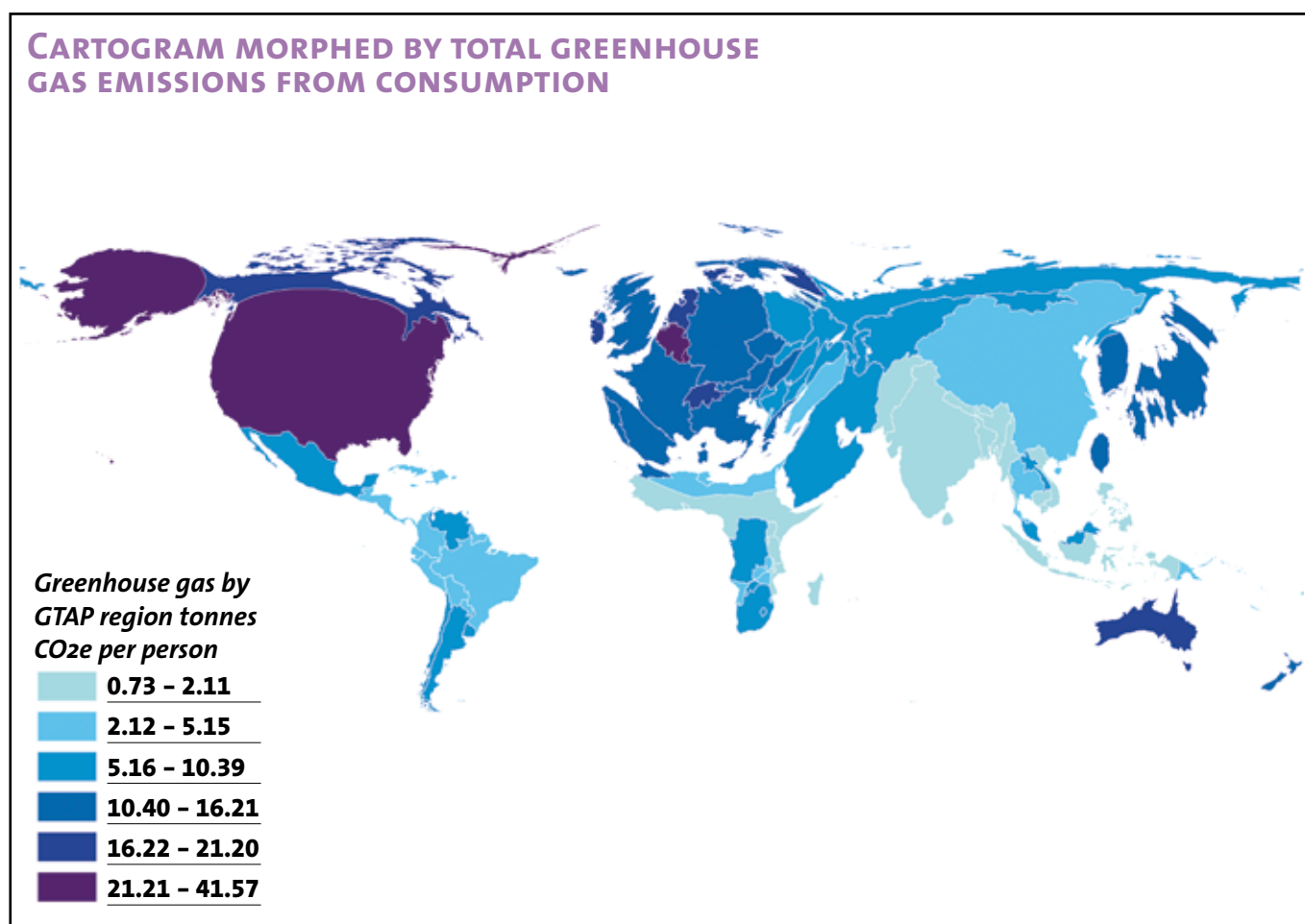
More instructive still is the contrast between the US and China – which are the two highest emitters in the world. Taking a consumption-based view would mean that US emissions increased by 8%. Although this might sound small, the country's very large overall emissions means that this accounts for an additional 576 million tonnes of greenhouse gas emissions – equivalent to Mexico's entire consumption.

For China, by contrast, switching from a production to a consumption view would take 850 million tonnes off its accounts. China is increasingly becoming the "factory of the world", and nearly 20% of its emissions are produced on behalf of other countries.

As mentioned above, there are many good reasons why governments should continue to base their international negotiations on a production-based system of accounting. However, policy makers should complement their nationally based approach by harnessing the power of the consumer and associated business sectors to cross national boundaries and provide

FIGURE 6:

Morphed graph produced by Stockholm Environment Institute, from data provided by Hertwich and Peters (Hertwich and Peters, 2009)



rapid and substantial emissions cuts. Multinational companies are well placed to aid in this endeavour. Their supply chains often span continents, and many are already measuring and reporting their emissions across borders and working to reduce them in response to consumer demand. They also have considerable capacity to innovate and will do so in response both to helpful government intervention and – particularly – to increasing consumer demand for low-carbon products and services.

3.2 HOW CONSUMERS CAN MAKE A DIFFERENCE

There are many reasons why putting consumers at the heart of the fight against climate change offers a powerful

complementary approach to the current production-based view:

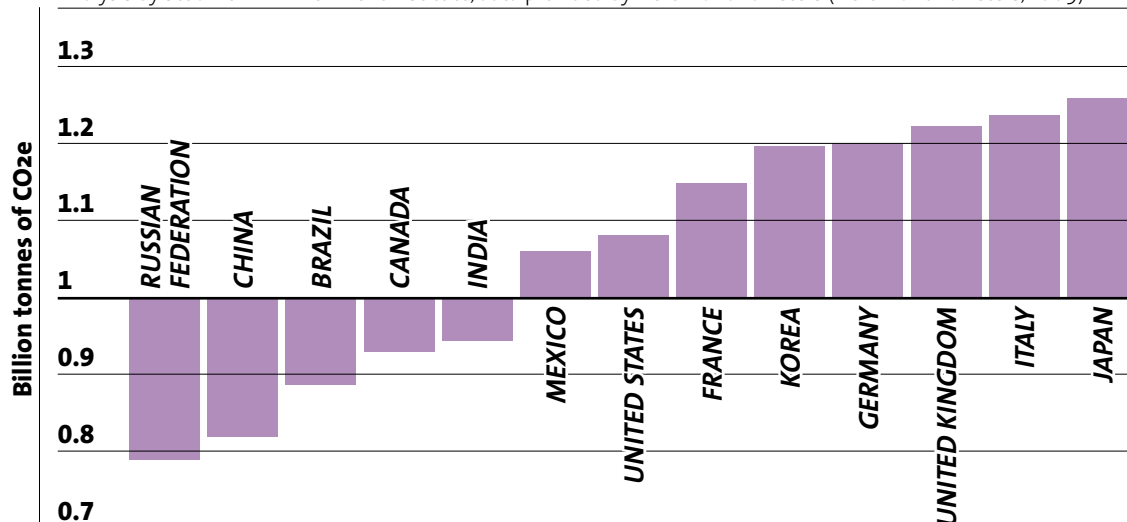
- **Consumer action can have a significant impact.** Looking simply at currently available actions and solutions, behaviour change and product choices could deliver around 75% of the emissions reductions we need by 2050. By stimulating new technology and other new ways of doing things, this impact could be much greater over time.
- **It's inexpensive.** Encouraging consumers to do things differently, for example to switch their light bulbs or wash their laundry at lower temperatures, is cheaper than many of the big technology solutions currently being explored. And it will save people money.
- **It's immediate.** The case studies in this



FIGURE 7:

The percentage difference between production-based and consumption-based emissions for the 13 highest emitting countries

Analysis by Stockholm Environment Institute, data provided by Hertwich and Peters (Hertwich and Peters, 2009)



paper illustrate how there is often no need to wait for new technologies, laws or infrastructure. For instance, getting people to change their lightbulbs can reduce emissions from power generation very quickly – in advance of the new clean power stations we need.

- **It's sustainable.** Adopting low carbon habits, however small, will ensure that the changes will be sustained. And if we help consumers change their behaviour voluntarily, every tonne of carbon they save this year is a tonne they are likely to save next year and in subsequent years, magnifying the impact.
- **It's enabling.** Empowered consumers will reward low-carbon businesses. To win customers and market share, businesses will invest in lower-carbon products and services. They will seek innovative ways to lower both their own carbon footprints and those in their supply chains.
- **It will drive the policies we need.** Politicians in many countries are holding off taking big decisions on low-carbon technologies because they fear that voters don't support them. The balance of public attitudes can delay a nuclear power station or a wind farm, just as much as a new

airport runway. Consumer-driven initiatives can help to shift this balance, emboldening politicians to make the decisions we need.

3.3 OVERCOMING BARRIERS

According to many surveys from across the industrialised world, consumers want to act. For example, one survey conducted in the UK, US and China asked if respondents were willing to change their lifestyle to help reduce climate change. The proportion who said yes in the UK was 36%, in the US 38% and in China 69% (Lippincott, 2007).

However, in spite of this, consumers are not yet turning en masse to a low-carbon life. Could this be because they are being untruthful in the surveys? Not according to research performed by scientists at the Sustainable Consumption Institute. The researchers tested groups of people from across the UK to try to uncover their underlying attitude to acting on climate change. The technique involves flashing images of products and words on a screen. If subjects agree with the words associated with an image, they tend to respond more quickly than if they disagree (Greenwald, McGhee and Schwartz, 1998,

IAT Implicit Attitude Tests). The results showed that underlying positive attitudes to low carbon products were even stronger than the outward, explicit declarations. While 70% declared a bias towards low-carbon products in the explicit survey, in the tests of the implicit attitudes this rose to 83% (Beattie and Sale, Explicit and implicit attitudes to low and high carbon footprint products, 2009). Thus, it seems that many people are already positively primed to act on climate change.

Why then are they not doing so? The reason is that many barriers prevent them from switching to a lower carbon world. In a global survey of more than 10,000 participants, the main hurdles that consumers cited were lack of information about low carbon products (34%), lack of availability of low carbon alternatives (26%), and price (11%) (Boston Consulting Group, 2008). Add to these the fact that many people in the industrialised world feel they have insufficient time to pursue low-carbon alternatives (Southerton, 2003), or experience a feeling of hopelessness that one individual can make no difference to such a huge problem, and it's little wonder that consumers feel disempowered when it comes to fighting climate change.

Consumers clearly want to change. The challenge for companies and policy makers is to empower them to do so, by removing the barriers that are currently holding them back. The rest of this document will explore these barriers and potential strategies to remove them. Note that although there are many other important aspects of environmental and sustainable activities, this report focuses specifically on greenhouse gas emissions reductions and the role that consumers can play. The next section considers innovative approaches to providing low-carbon products and services in the most economically effective way.

CASE STUDY:

Together.com

The Climate Group's 'Together' campaign (www.together.com) works with a coalition of businesses to make it easier for consumers to tackle climate change in their daily lives. The campaign recognises that taking action on climate change is not top of most people's to do lists. Not only do people feel powerless in the face of such a big problem but there aren't many who'll make a 'green' purchase out of the sheer worthiness of it.

These barriers are tackled through a set of guiding principles:

Don't lecture: nobody likes being told what to do; it has the tendency to make them stick their heads in the sand.

Make it easier: people will take simple actions if they feel like they are being met half way – businesses must make it easier, more affordable, or even more fun.

Focus on specific actions: concentrate on single, relevant messages rather than lists of 'top 10 tips'.

Don't go it alone: climate change communication is often contradictory and confusing. The coalition in 'Together' enables sharing of a common language, common standards and common ideas.

Build credibility: independent NGO backing helps avoid the possibility of 'greenwash'.

Corporate stances aren't enough: people now expect companies to be taking climate change seriously; they want to know what's in it for them.

Show progress: people like to feel their small actions make a difference. To date the campaign has enabled consumers to save over 1.5million tonnes of CO₂ and reduced household bills by more than £280million.

Launched in 2007, 'Together' involves an unprecedented collaboration that includes B&Q, Barclaycard, British Gas, Coca Cola, M&S, National Express, O2, Sky and Tesco.

4. MAKING LOW-CARBON PRODUCTS AVAILABLE: INNOVATION AND THE SUPPLY CHAIN



As mentioned in Section 3, a key barrier preventing consumers from acting on climate change is the lack of available low-carbon alternatives. To overcome this barrier, businesses will need to turn to new technologies and innovations.

Until now, most of the technological efforts to tackle climate change have focused on decarbonising the energy supply. This is crucial, but is not the only way to achieve emissions reductions. Putting consumers at the heart of the solution provides a new lens through which to see the power of innovation; it could open up a host of opportunities for businesses to design, produce and distribute low-carbon products and for consumers to reduce the emissions they create in using and disposing of them.

It is by seeking out these opportunities that businesses will be able to grow in a dynamic new low-carbon economy.

Indeed, businesses are already having to build climate change into their strategies when dealing with specific issues such as palm oil, deforestation and water depletion: so it is not a new issue, but one with great potential for further exploration.

THOUSANDS OF INNOVATIONS, BILLIONS OF EFFECTS

In their pioneering work on technological solutions to climate change, Princeton researchers Stephen Pacala and Robert Socolow said: “Improvements in energy efficiency will come from literally hundreds of innovations that range from



istockphoto.com

new catalysts and chemical processes, to more efficient lighting and insulation for buildings, to the growth of the service economy and telecommuting” (Pacala and Socolow, 2004). Though this sounds impressive, they were actually being conservative. There are thousands of potential innovations that could help us tackle climate change.

If these innovations are directed towards consumers, the effect of each one can be amplified millions or even billions of times, making the cumulative effect very powerful. For example, Unilever calculates that its laundry products are used worldwide for more than 125 billion washes per year. A single innovation, applied millions of times, can lead to very large savings.

SUMMARY

Sources of emissions are often linked across countries and continents. The demand for a product in one country often stimulates production in another country, followed by distribution across continents and then sale, use and disposal in the country where the demand originated. These supply chains – and the businesses that organise them – can play an important part in the battle to reduce emissions. In particular, lifecycle analysis of products and services can lead to innovation for tackling emissions “hot spots”.

The businesses involved are often international in outlook and organisation and well-equipped to play their part in this global task. Many have already begun to address climate change issues out of necessity and foresight, but there is great potential to go further.

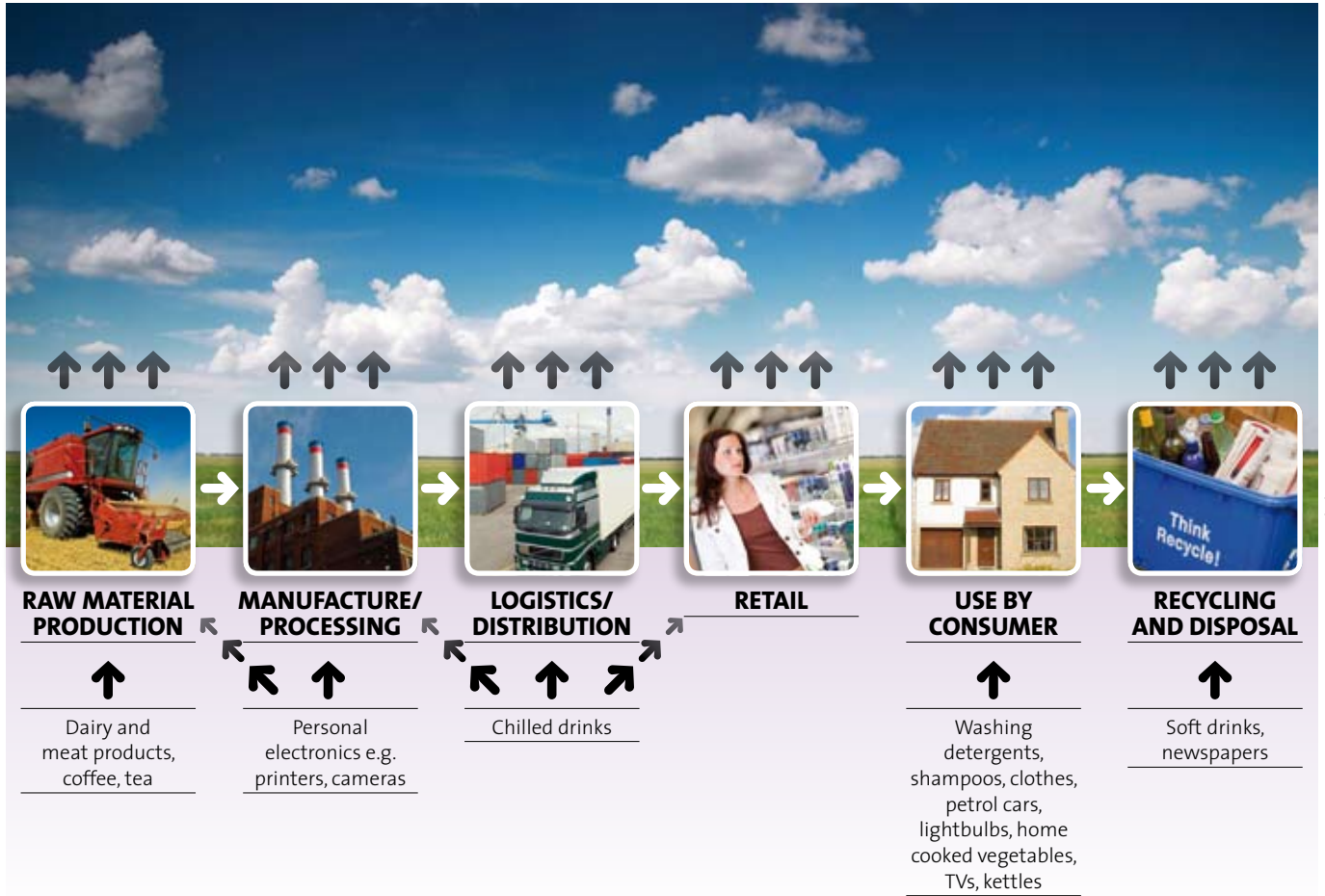
To do this they need to be stimulated by market and consumer demand and rewarded by consumer preference. If we succeed in stimulating consumer demand for low-carbon products and lifestyles, businesses will respond by coming forward with new products and services, better information and marketing activity as part of the new low-carbon economy.

Given the urgency of the task, we should examine ways to accelerate this business response, and to ensure it is international in its organisation and impact. Strategies to achieve this could include:

- Understanding that business action to reduce emissions must focus on all stages in the process – primary production, manufacture, distribution, consumer use and disposal.
- Strengthening this process by developing internationally agreed measures of the carbon content and impact of products and services. Applying international accountancy standards would make the pursuit and adoption of these measures more efficient and accessible.
- Finding effective ways for businesses to collaborate on emissions reductions at all stages in the supply chain, homing in on the “hot spots”.
- Stimulating demand for low-carbon products and services through incentives and other mechanisms, without customers having to make trade-offs on performance or value.



FIGURE 8:
The full carbon lifecycle of products giving examples of key “hot spots”



4.1 MEASURING EMBEDDED EMISSIONS

One of the most effective ways that businesses can take the fight against climate change across national boundaries is by measuring the emissions that arise from every stage in the lifecycle of the products and services they provide. This allows them to identify emissions “hot spots” in the lifecycle, and hence to find innovative ways to reduce the embedded carbon in their products and services.

Figure 8 illustrates the different factors that go into a product’s lifecycle, as well as how the hot spots for different products occur in different parts of the chain.

Consumers influence all of these stages, whether directly as they buy, use and dispose of their products, or indirectly through the effect their demand has on the products’ manufacture and distribution. The greater the demand for low-carbon products, the more incentive businesses will have to provide them. Moreover, as non-industrialised nations pursue their development paths, insights gained within high-consuming nations should help tackle the emissions growth pathway in nations worldwide.

To date, few studies have even tried to estimate the potential emissions savings that could come from harnessing the power of consumers. However, calculations that look only at the second half of the

FIGURE 9:
Basics of how to calculate a lifecycle footprint

(PAS2050 guide 2008)



1. BUILD A PROCESS MAP

Define the functional unit, list the ingredients, list the activities, identify sources, account for waste streams and transportation, and describe the consumer use phases.



2. CHECK BOUNDARIES AND PRIORITISE

Select methodology which defines boundaries and articulates the product category rules (PCR). These may need to be developed. Do high level assessment of emissions to prioritise data needed.



3. COLLECT DATA

Collect activity data on processes, quantities and materials and collect the emissions factors needed to convert activity quantities into greenhouse gas emissions. Collect primary data where possible from own operations and engage principal suppliers to share their data for the products in question. Search available data sources for consistent secondary data e.g. for grid emissions factors per kwh, or fertiliser emissions per kg. Data on use phase can be difficult – some can be found in PCRs or Energystar databases, but if not it will need to be defined.



4. CALCULATE LIFECYCLE EMISSIONS FOOTPRINT

The footprint calculation then sums all the energy, materials and waste quantities multiplied by their emissions factors to arrive at a CO₂ equivalent footprint. Calculate a mass balance check to ensure that all inputs and outputs have been accounted for. Adjust for carbon stored in products, for delayed emissions (e.g. from landfill), for land use change if applicable and for recycling or reuse.



THEN REDUCE!

(BSI, 2008)



chain – use and disposal – suggest that relatively simple changes in the ways that consumers behave could reduce global emissions by between 3.5 and 5 billion tonnes of CO₂e by 2030 (McKinsey, 2008).

Businesses need a reliable and consistent way to measure the greenhouse footprint of products and services they provide. This means looking at emissions from every phase of the lifecycle: sourcing the product, manufacturing or packaging, transportation from the source to the intermediaries to the end-user, the use of the product during its lifetime and, finally, its disposal. Figure 9 shows more detail about the stages of constructing a typical lifecycle analysis.

CASE STUDY:

Coca-Cola

In 2008, Coca-Cola Enterprises Ltd and its project partners reduced the weight of its aluminium drinks cans by 5%, setting a new standard across the European Union.

The body of the new can was less than 0.1 mm thick, about the width of a human hair, but tests showed that it was just as strong as before. Though the change in each can may seem small, by the end of 2008 6.5 billion of the new cans had been distributed by many different beverage brands and brewers. This rose to more than 15 billion cans across Europe in 2009. The Waste & Resources Action Programme (www.wrap.org.uk/retail) calculates that the new can design will save 15,000 tonnes of aluminium across the EU each year, equivalent to nearly 80,000 tonnes of CO₂.

This work was driven partly by Coca-Cola's lifecycle analysis of its products which showed that one of the "hot spots" for carbon reduction was in packaging.

4.2 LESSONS LEARNED

Many teams across the world have been applying lifecycle analysis to the emissions generated by the goods and services we consume. These initiatives have usually taken an International Standards Organisation standard (ISO 14040 series) as their basis, and have then developed further rules, datasets and specifications to arrive at estimates for a product's so-called "carbon footprint" (See Figure 10). These world-wide initiatives show that lifecycle analysis can be done; they have also provided many useful lessons.

A full lifecycle analysis can throw up surprises

A German PCF study, Tchibo discovered the importance of looking at the whole lifecycle of their products, and not just a part of it. Before the study, Tchibo had been making considerable efforts to reduce emissions from its logistics. For example, the company had assumed that shipping its coffee from Tanzania to Europe would make a significant contribution to the overall emissions. However, the consumer-based lifecycle analysis showed that cultivation on the farm accounted for the largest share of the emissions at 56%, primarily from application of fertilisers and pesticides. Consumer preparation of the coffee was the next biggest contributor at 30%. By contrast, transport across the entire supply chain and packaging together accounted for only 12%.

Reliability of data

The data for lifecycle analysis takes two forms: primary data, which is measured especially for the analysis, and secondary data, which covers typical levels of emissions per unit energy used. Clearly both of these need to be reliable, but the secondary data sources also have the potential to reduce complexity and cost and save considerable time when producing lifecycle footprints. Several

FIGURE 10:
Different international initiatives under development

Greenhouse gas footprinting methodologies

DIFFERENT INTERNATIONAL INITIATIVES UNDER DEVELOPMENT



United Kingdom: A consortium including the Department for Environment, Food and Rural Affairs, the British Standards Institute and the Carbon Trust has been working since 2007 with companies including Tesco,

Pepsico, and Innocent drinks to develop a specification for assessing lifecycle greenhouse gas emissions of goods and services. The companies have now applied the resulting codes, PAS2050, to several hundred products and services from toilet tissue to home insulation services.

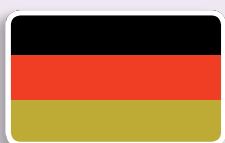


France: Retailer Casino has measured lifecycle greenhouse footprints for several hundred of its own-label food products. The French Environment and Standards Agencies are meanwhile developing a new methodology that is proposed to be mandatory for products

sold in France from January 2011.



Japan: There is a new national guideline for the carbon footprint of products, and pilot studies have been carried out on products from steamed rice to inkjet printers. Further trials are planned through to 2011.



Germany: A particularly comprehensive project in 2008 (the PCF-pilot study) combined the resources of the Potsdam Institute for Climate Impact Research, WWF, The Institute of Applied Biology, and

Thema1 with 10 consumer goods companies including Henkel, Tengelmann, Rewe and Tchibo. The consortium tested products from washing powder to coffee and internet dial-up services, and produced a set of recommendations for developing and applying their methodology.



United States: In July 2009, Wal-Mart announced that it aims to measure the full lifecycle greenhouse gas emissions from its products. The company is now asking all its suppliers whether they measure their own carbon footprint.

secondary data sources are available or under development, including Ecoinvent, the European lifecycle database and the Carbon Trust databases. However, these do not always fit with the different methodologies and can be expensive to access. Data sources are particularly sparse on consumer use of products, leading some to say that the use phase information should be separated from the rest. Especially given the difficulties of obtaining reliable emissions data, existing international accountancy skills could be helpfully applied to the climate problem.

Collaboration down the supply chain

Collecting the data necessary for a full lifecycle assessment often involves several organisations located in different places. Even a relatively straightforward product such as orange juice could involve multiple growers in Brazil, fertiliser manufacturers in Mexico, packaging providers from the US as well as packers, shipping companies, haulage and storage companies and then retail outlets and recycling firms wherever the juice is consumed. Taking the consumer-based view thus requires each partner in the chain to understand and measure its use of energy – and to be prepared to share. The different methodologies can be important here. For example, if a methodology requires that emissions be allocated based on the value of a material in the supply chain, suppliers may be reluctant to share, citing commercial sensitivity. In that case, collaborations can be even more important, as intermediaries step in to collect and verify information. It also increases the need for traceability of components and of waste or by-products.

Focusing on category-level differences

The parts of the lifecycle most ripe for emissions reduction tend to differ more by category of product than by variations within a category (see figure 11). Thus, at this early stage in



the development of lifecycle analysis, it might be more important to focus on category-level differences than on differences between individual products. This could help foster collaboration and also help develop meaningful advice for consumers. General rules such as: wash at low temperature; switch off when idle; re-use this bag 30 times; keep the lid on the food when cooking; use a microwave; could all be good ways to help users focus their efforts wisely.

Understanding how consumers use products

To obtain a meaningful analysis across

the entire lifecycle, we need to know, at least roughly, how a product or service is likely to be used. Finding this out can make a significant difference to the overall emissions calculations. In 2009 Tesco worked with the Carbon Trust to measure the emissions footprint of its UK home insulation service. The calculations showed that installing insulation in the average home would reduce an average household's emissions by up to 17 tonnes over the lifetime of the insulation (40 years), as long as homes were maintained at the same temperature as before. However, studies show that when homes are insulated, people tend to let the temperature of their homes rise a little – the so-called “rebound effect” or comfort factor. This can reduce the emissions benefit by nearly a quarter (Martin and Watson, 2006). Consumer actions are dynamic not linear, and are therefore complex. In 2009, Unilever tried to improve its understanding of how consumers behaved when washing their clothes by conducting a pilot research programme. This included both interviewing consumers and putting loggers and water sensors into the washing machines and water pipes of selected interviewees to track actual product use, dosage, water consumption and water temperature.

Setting the standard

For lifecycle analysis to become widespread, we will need to find ways of simplifying the analysis procedure and hence reducing cost. The current proliferation of methods and diversity of approaches is clearly counter-productive. What we really need is a reliable, international standard that allows free comparison of the carbon impacts of products around the world without posing a barrier to trade. A harmonised international standard needs:

CASE STUDY:

Reckitt Benckiser

In November 2007, Reckitt Benckiser launched ‘Carbon 20’, a ground-breaking initiative to measure and then reduce the company’s global products’ total carbon footprint across their entire lifecycle by 20% by 2020 (www.carbon20.info).

This ‘whole lifecycle’ approach is unique and different because Reckitt Benckiser are not just targeting the easy wins under their direct control, like energy reduction in their factories or business travel. Instead Reckitt Benckiser are also tackling the much larger carbon emissions embedded in the raw and packaging materials provided by their suppliers, and from consumers’ use of their products in the home. This ‘whole lifecycle’ approach is important because consumer use comprises about 70% of the carbon footprint of the company’s global products, while raw and pack materials from its suppliers comprises another c. 20%. Thus less than 10% of the company’s products’ whole lifecycle emissions are under its direct control; its Carbon 20 programme is working to tackle the more than 90% that sits with consumer use and the raw and packaging materials it buys, while also still reducing the direct emissions from its own activities.

CASE STUDY:**Danone**

In 2008, Danone Group decided to make their CO₂ footprint a key performance indicator for the business. Since there was no standard tool available to calculate emissions across the full product lifecycle, they developed their own, which they called “Danprint”.

Boundaries: The first question they faced was where to draw the line. They initially measured emissions from ingredients, manufacturing, packaging, transportation and store which worked well for their bottled water business. However when adapting the tool to the baby foods business, Danone realized that the consumer use phase was vital and needed to be added into the mix.

Information: The next issue was the absence of reliable data on some of the most important ingredients. For milk, the company had to develop their own model. For other ingredients, they applied the best available data from sources such as the Greenhouse Gas Protocol and Ecoinvent to all their countries. However, this does not permit variations within a country, even when some local suppliers claim to have fewer emissions than others. As suppliers find individual ways to reduce their emissions, this will clearly need to change.

Allocations: Danone needed to know how to allocate a cow’s emissions between co-products – for example between meat, milk and yogurt. They solved this by consulting the French Environment Agency, Ademe, and taking advice from professional organisations.

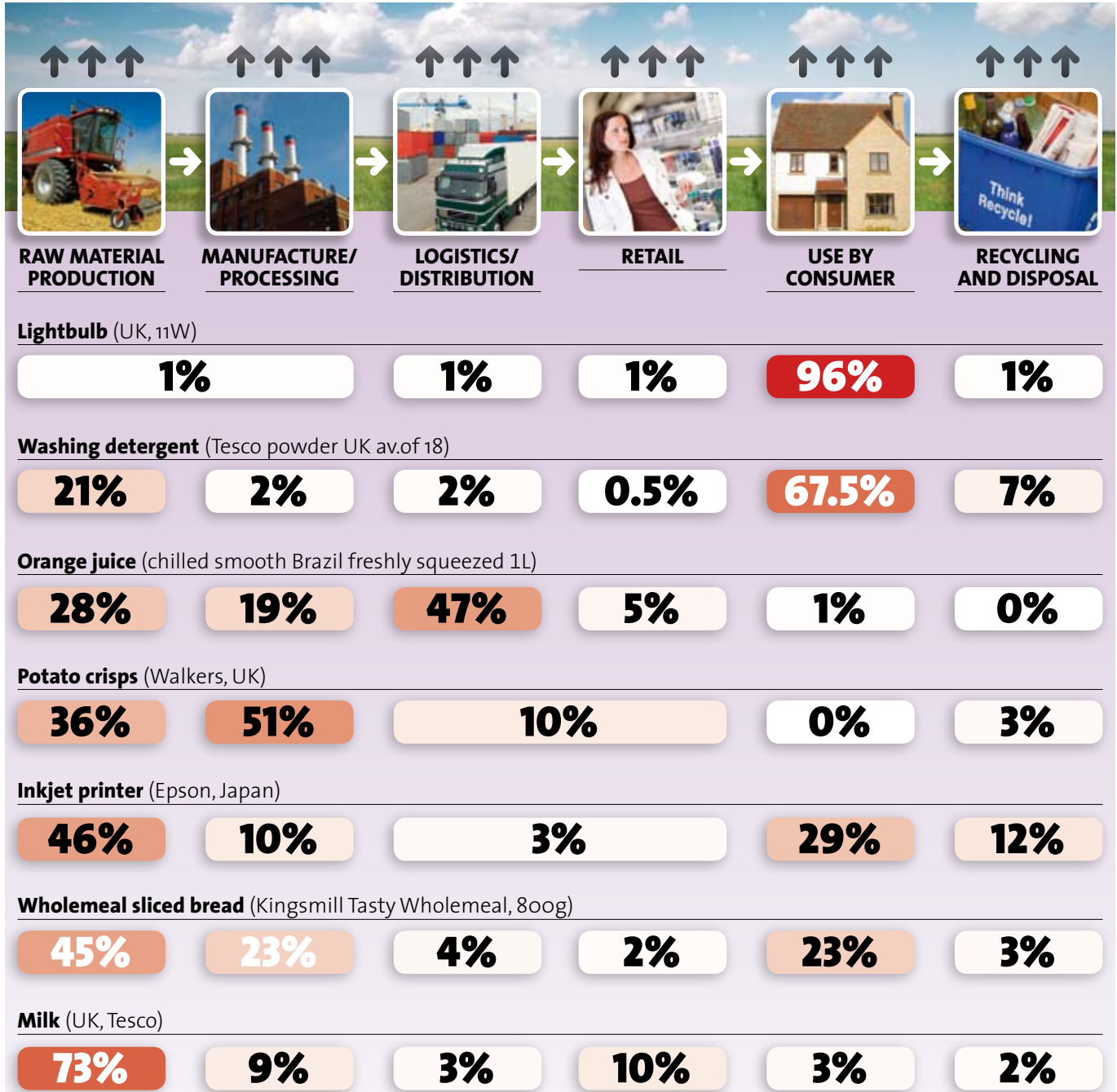
Engaging businesses and partners: Footprinting is time consuming, and the benefits come only in the long-term. Thus, Danone focused on their biggest products while ensuring that they were representing all categories. They also provided incentives by including the requirement to implement footprinting in the remuneration packages of senior managers.

Results: The Danprint tool was certified by Price Waterhouse Cooper, the Carbon Trust and Ademe in 2009. Danone have applied it to all subsidiaries in the dairy and water business around the world and are now rolling the tool out to all their baby and medical businesses.

- **Defined scope and boundaries:** For example, aviation and renewable energy used in production plants are both currently omitted from some methods. There is also a question about whether to include emissions from the consumer shopping trip.
- **Clear product category rules:** Emissions from a cow need to be allocated between milk and other dairy products such as yoghurt and butter. But how? Should this be on the basis of fat content, or by value or volume?
- **Simplicity and ease of application:** Experience will drive understanding up and costs down, but the standard still needs to make lifecycle analysis as simple as possible. This will require more than just sets of rules. For example, the standard can determine the sorts of data to be used, but this also requires good quality secondary data to be made freely available.
- **Widespread acceptance:** Clearly, unless a standard is accepted very widely among different countries, manufacturers and retailers, it will have little weight.



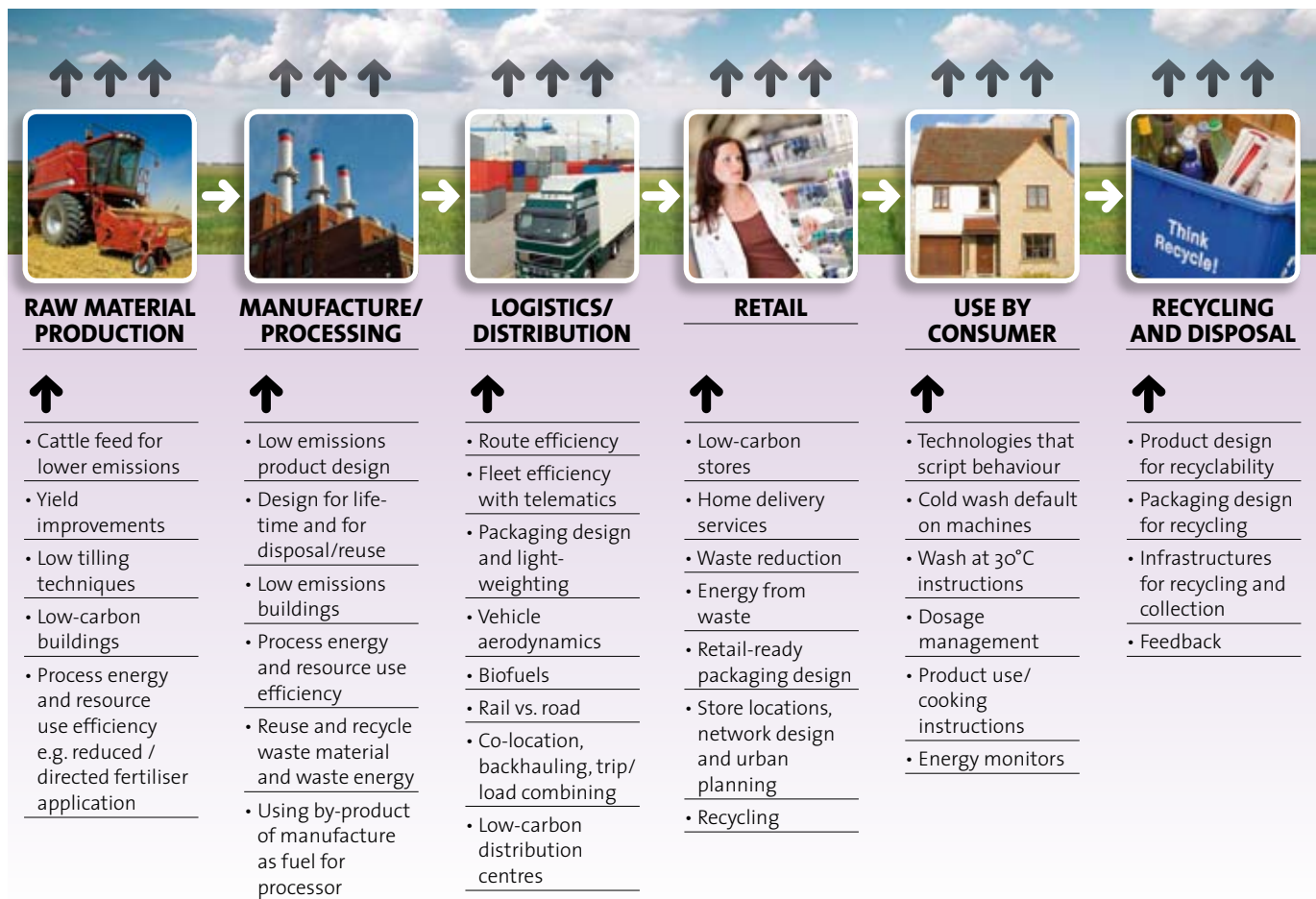
FIGURE 11:
Very different lifecycle impacts across product categories



Sources / Notes:

- Lightbulb: Tesco standard 11W CFL based on 100 hours' use in UK. PAS2050 compliant. Certified by the Carbon Trust
- Detergent: Tesco powder detergents, average of 18 product lines PAS2050 compliant. Certified by the Carbon Trust
- Orange juice: Tesco smooth freshly squeezed chilled from Brazil. PAS 2050 compliant. Certified by the Carbon Trust
- Potato crisps: Walkers, UK. Note 15% packaging included in manufacture. PAS 2050 compliant. Certified by the Carbon Trust
- Printer: Epson PM-G4500 inkjet printer based on three-year period of use and 7200 ordinary paper prints. Does not include the footprint of the paper used. Based on JEMAI standard Eco-leaf Certificate No. AD-o6-o8o
- Bread: Wholemeal bread, sliced, Allied Bakeries, PAS 2050 compliant. Certified by the Carbon Trust
- Milk: National average of semi skimmed milk footprints. PAS 2050 compliant. Certified by the Carbon Trust

FIGURE 12:
Examples of innovation levers across the lifecycle of consumer goods



There are currently two key initiatives that look promising:

- The International Standards Organisation (ISO) is now drawing up a new international standard called “Carbon footprints of products” (ISO 14067) which will be published in 2011.
- As part of their Greenhouse Gas Protocol initiative, the World Business Council for Sustainable Development and the World Resources Institute are collaborating with scientific and business experts and environmental institutions to develop a “Product and supply chain accounting and reporting standard” by the end of 2010.

4.3 FOCUSING ON THE WHOLE LIFECYCLE

The emissions “hot spots” identified in the supply chain or use phase of a product can focus companies’ innovation efforts on the parts of the lifecycle that are likely to bring the most significant emissions reductions. Figure 12 shows some examples of innovations that are already helping reduce emissions across the full lifecycle of consumer goods.

RAW MATERIAL PRODUCTION



When PepsiCo researchers measured the lifecycle emissions of their Tropicana orange juice, they discovered that the largest source of



emissions came not from packaging or transportation but from the process of growing oranges. Citrus groves use large amounts of nitrogen fertiliser, and when this is spread it can turn into N₂O, a greenhouse gas that is nearly 300 times as potent as CO₂ (IPCC, 2007) and one of the biggest contributors to emissions from agriculture. As a result, they worked with the growers to find ways to reduce the amount of fertiliser they applied, which both saved money and cut emissions.

As well as agriculture producing emissions itself, it can also be linked to deforestation, where the farming process is not carefully managed. Deforestation is responsible for some 20% of total global greenhouse gas emissions, so businesses and consumers can have a huge positive impact by ensuring that responsible agricultural practices are put in place and enforced.

Changing the nature of the raw materials can also affect emissions farther along the lifecycle. For example, new materials in washing detergents can make them more effective at lower temperatures during the use phase (see below).

MANUFACTURE/PROCESSING



Many production sites generate excess heat. At a site in Illinois, US, Henkel captured much of the process heat from production and used it to heat office buildings. They thus saved up to 1,750 megawatt-hours of energy per year, corresponding to about 350 tonnes of CO₂. Henkel is now using this concept in most of its production sites. The company also made innovations in the logistics of its production. For example, by producing their bottles on site instead of bringing them in from outside, the company avoided 14,000 truckloads, corresponding to 43,000 tonnes of CO₂ per year.

General Mills processes oats for use in its cereals, with oat hulls left as a by-product. The company is now sending nearly 90% of these hulls to Koda Energy, a \$55 million biomass power plant in Minnesota. Currently, ash from the burning process is sent to landfill, but in the future that material will either be applied as a fertiliser or sold to concrete companies for incorporation into building materials.

LOGISTICS AND DISTRIBUTION

Transportation



To reduce emissions from transport, companies are optimising or sharing routes, using biofuels, increasing vehicle

efficiency, training drivers in techniques to improve efficiency and shifting loads from road to lower carbon rail or shipping.

In the US, the Kellogg's 800-vehicle truck fleet uses about 4.5 million gallons of diesel fuel annually, which equates to about 46,000 tonnes of CO₂ emissions. Since 2006, the company has cut this by about a third by increasing its use of rail. They have also installed GPS tracking and speed controls on the entire US fleet, which has minimised the number of miles travelled and increased fuel efficiency by 5%. In 2006 in the UK, Kellogg's teamed up with the health and hygiene company Kimberly-Clark and the supply-chain management company TDG to consolidate shipments to retailers. First rolled out in London, the partnership is now in operation throughout the country and saves the companies 270,000 miles and 30,000 gallons of diesel per year, reducing their annual CO₂ emissions by 380 tonnes. Similarly, Garnier in the UK now shares trucks and consolidation centres with other retailers.

Distribution Centres

A 215,460 sq ft snacks distribution centre in Hagerstown, Maryland was Kellogg's

first facility to be certified by the US Green Building Council's Leadership in Energy and Environmental Design (LEED). Its fluorescent lighting uses 50% less energy than traditional fixtures; it contains state-of-the-art, blow-through space heaters that achieve 40% energy savings; and has a white rubber roof that reflects sunlight, reducing energy use for cooling in summer.

In 2008, Canadian retailer Sobeys opened a 140,000 sq ft perishable distribution centre in Quebec, which is the first in Canada to be built according to the LEED standard. During winter, the refrigeration system captures cold air from outside, while offices are heated using reclaimed heat from the compressors. When any product arrives at the centre, its temperature is taken and refrigeration needs adjusted accordingly. Insulated acrylic windows admit enough daylight to eliminate the need for daytime electric lighting, motion detectors turn off artificial lights at night after five minutes of no activity and low-energy LEDs illuminate the parking lot. The company says that energy costs are 55% lower than comparable facilities and Sobeys is now evaluating whether to roll out these features to its other distribution centres.

RETAIL



In January 2009, Tesco opened a new low-carbon store at Cheetham Hill in the UK, which is intended as a blueprint for future facilities (see case study on page 32). In Australia, cooling and refrigeration loads are responsible for most of the carbon emissions from food retailing stores. Woolworths has therefore developed a lower emissions template for its stores that includes: efficient lighting; automated control systems and motion sensor lighting for non-trading areas; LED lighting for freezer doors and all signage;

CASE STUDY:

SC Johnson

SC Johnson is a pioneer in reducing greenhouse gas outputs at its manufacturing facilities and has implemented several major initiatives to reduce its carbon footprint.

For example, at its largest US factory, SC Johnson installed co-generation turbines fuelled by methane gas from a nearby landfill. And at its largest European factory, SC Johnson built its own wind turbine. As a result of initiatives like these, since 2000 SC Johnson has cut its global emissions by 27% on an absolute basis and 42% indexed to production.

A particularly creative SC Johnson initiative has been a biomass project in Medan, Indonesia. In 2008, the local team constructed an innovative burner/boiler system that now runs on palm shells, the remaining waste of the palm oil industry.

As a waste product, palm shells are often burned under uncontrolled conditions. By using them as a fuel source instead, SC Johnson is transferring a former waste product into the value chain with minimal environmental impact. As a result of this initiative, SC Johnson cut emissions at the Medan factory by more than 15%, while use of diesel fuel has been reduced by 60%.

To ensure a sustainable and responsible supply of the shells, SC Johnson has put supply chain policies into effect and ensured that the waste shells the company uses are purchased from a single, verified sustainable source.

high efficiency fans and low-heat glass door freezers. These measures collectively reduce the CO₂ equivalent emissions from their stores by more than 35% per square meter compared to a typical store in 2006. All stores opened since September 2008 met these new specifications.



USE BY THE CONSUMER



Currently, the average washing temperature in Europe is 46°C. Henkel calculates that reducing this to 30°C can cut emissions during the use phase of laundry detergent by up to 50%. Similarly, Unilever estimates that 25-70% of the emissions associated with their laundry products occurs during use. They also point out that as more consumers worldwide move from hand-washing to machine-washing their overall greenhouse footprint will increase so the emissions savings prize becomes more significant.

RECYCLING/DISPOSAL



The Coca-Cola Company is advancing an integrated End-to-End approach to packaging that focuses on preventing material, energy and water losses across the entire life of its packages. Coca-Cola's End-to-End approach involves: designing innovative, consumer preferred packages; optimising packaging material use (reduce); advancing post-consumer recovery; reusing packaging materials; increasing renewable material use; and inspiring others by using its brand voice to connect with stakeholders and consumers. The End-to-End approach can be illustrated through the example of a 16 oz Dasani PET water bottle:

- The light blue colour of the bottle was chosen so it would be easily recycled in the clear PET stream, and materials used in the cap and label were specifically selected for their separation efficiency and recyclability.
- The current Dasani PET bottle is more efficient than ever: 40% lighter than the original without any increase in secondary or transport packaging weight. The Company also introduced a short height closure that is 38% lighter. The global roll out of this cap will prevent the equivalent plastic use of 1.6 billion half litre bottles and 6.7 billion caps.
- Coca-Cola is working to increase the amount of packaging that is recycled. That is why they created Coca-Cola Recycling, a company that is focused on recovering 100% of Coca-Cola's bottles and cans in the US, and support community recycling programs like RecycleBank.
- In 1991, Coca-Cola was the first to use recycled content in a PET bottle and has continued to advance recycling technologies that allow even more recycled content to be incorporated back into PET packaging. The Company has

CASE STUDY:

Tesco

In January 2009, Tesco opened a store at Cheetham Hill in Manchester using a new, low-carbon blueprint, the result of bringing together everything that had worked well in the company's existing environmental stores. The store has a carbon footprint 70% smaller than an equivalent store built in 2006 and, planning permitting, will be the model for stores built in the UK from now on.

The carbon savings came from an innovative mix of environmentally friendly design, materials and technologies. These included a frame made from timber instead of steel, 12 roof lights each measuring six metres across to cut down on artificial lighting, and a refrigeration system which uses CO₂ as a coolant rather than more potent greenhouse gases, hydrofluorocarbons (HFCs). Attention to detail included using more material with recycled content and designing store equipment such as signs to be easily recycled.

made significant direct investments in PET recycling facilities around the world, including the world's largest in Spartanburg, SC.

- The Coca-Cola Company is increasing the use of renewable, recyclable materials. In late 2009, the Dasani bottle will be piloted using the innovative, PlantBottle, a new PET bottle made from a blend of traditional petrochemical-based PET and up to 30% plant-based renewable material. This bottle looks, feels, and can be recycled just like a traditional PET bottle, but it has a lower carbon footprint.
- Coca-Cola is also inspiring others through marketing campaigns that remind customers and stakeholders that Coca-Cola bottles and cans are valuable resources they want back.

This is just the beginning. As companies assess the full consumer-based view they will find many new solutions for reducing emissions throughout the lifecycle. To do this most effectively will take more than just innovations within a given organisation. Instead, as the above examples show, to harness the power of innovation we will need new networks and collaborations between producers, retailers, governments – and consumers.

4.4 NETWORKS AND COLLABORATIONS

Successful innovation, which was once the preserve of single firms acting alone, now increasingly occurs in distributed networks, often involving both public and private organisations. By collaborating in this way organisations can share knowledge, and make sure that innovations at different parts of the chain are compatible.

For example, in 1992, IKEA decided to include new paper in its catalogues, using chlorine-free pulp with at least 10% recycled fibres. When their main

CASE STUDY:

The Kyoto Box

Cooking in developing countries accounts for up to 90% of the energy used by rural families and most of this comes from felled trees. As well as causing greenhouse emissions, this leads to millions of deaths from smoke inhalation and spinal injuries from firewood collection.

Kyoto Energy Ltd, a Nairobi based R&D company, has developed a solar cooker called the Kyoto Box, which is made from durable plastic in existing manufacturing processes and folds flat to fit thousands on a lorry. At €15 per unit, it is much cheaper than existing box solar cookers and could reach up to 500 million families who are currently using firewood.

Each Kyoto Box can save several tonnes of CO₂ emissions per year. Selling these carbon credits to the West will make the box free for the participating households. To make it easier to sell these carbon credits, Kyoto Energy is developing a “Kyoto Club”, where households report their detailed energy use via mobile phones. This approach lowers the risk in buying carbon from African households, while also cutting the cost of monitoring. Kyoto Energy has also developed the Kyoto Family package, which includes a solar flashlight, a solar water heater bag and a smokeless biomass cooker that uses biowastes such as corn cobs or coconut husks. The entire package can be financed by carbon credits.

www.kyoto-energy.com

paper supplier, Haindl, declared this was impossible, IKEA turned to a network of pulp and fibre companies, paper manufacturers, and chemical and gas firms. No single company could have produced the innovation. IKEA got its new paper thanks to the strong demand signal it sent out, which mobilised companies across the supply chain to collaborate to find the solution.



The laundry industry has also made use of networks. As we have already mentioned, lifecycle analysis shows that the temperature used for domestic laundry makes a dramatic difference to the overall emissions generated. But it's not enough simply to persuade customers to turn the

temperature down. Instead, companies such as Unilever, Henkel and P&G have each worked with partners down their supply chains – such as washing machine manufacturers (Electrolux), ingredient manufacturers (Novozymes) and clothes manufacturers (Marks and Spencer), to ensure that washing powders, machines and even clothes can all readily support a lower temperature. Companies down the supply chains then collaborated to stimulate demand for these products and encourage consumers to switch to lower temperatures – for example, see section 5.1 for more about a joint “turn to 30” campaign.

Policy makers can help foster these networks, by funding or promoting new partnerships. For example, the EU's ADDRESS project seeks to develop commercial and technical opportunities from smart electricity grids, which could be used together with smart appliances to reduce the carbon footprint of households. The project involves 25 academic and industrial partners from 11 European countries, spanning the entire electricity supply chain. The project started on 1 June 2008 and will run for four years, with the EU putting up more than half of the €16 million funding.²

Another good example of a public private partnership for innovation is the UK's Energy Technologies Institute, which aims to use the power of its industrial networks to accelerate the application of low-carbon innovations. The ETI has six core industrial members, whose funding is matched by the British Government.

Consumers themselves form an important part of innovation networks, not just as focus groups but as innovators in their own right. For example, text messaging was introduced to mobile phones almost as an afterthought. Yet consumers turned to texting in such large numbers and

CASE STUDY:

Danone

In 1999, Danone analysed the greenhouse gas emissions of their yoghurt and discovered that the biggest contributor was milk production, at more than 50% of the total. Though some of this came from the agriculture required to feed the cows, almost half came from methane produced when the cows burped. (Methane punches above its weight in climate change, as it is 23 times more potent than CO₂.)

The company therefore decided to set up a series of collaborations designed to help farmers reduce their cows' emissions.

In 2004, Danone began working with Valorex and the French National Institute for Agriculture Research (INRA) to develop a flax-based feed, rich in Omega 3 fatty acid. The idea was to mimic the spring grass that cows had eaten before modern farming methods took over, and thereby help smooth the cows' digestion.

The first pilot run in 20 farms in France showed that changing to this new feed cut the cows' emissions by 12 to 15%.

Danone has now extended the programme to the 400 farms with which it collaborates in France. In January 2009, the scheme went to the US, where Stonyfield Organic is piloting an experiment on 15 farms in Vermont.

such innovative ways that they invented a whole new language. It wasn't long before people were no longer making firm arrangements to meet each other, but counting on texts to refine the details at the last minute. Texting took over from voice as the prime function of many mobile phones.

Phone designers, in turn, realised they could innovate to profit from this. Thus came picture messaging, new phones in which more attention was paid to the keyboard, and a slew of new services where people could use texts to discover the latest news or sports scores, or their bank balance, or to vote in reality TV shows. The point here is that as consumers seek more ways to live a lower-carbon life, innovations in the way they use products and services could feed back to improvements in design. For this, and many other aspects of innovation to succeed, however, we will need to find ways to boost demand for low-carbon lives in the first place.

4.5 STIMULATING DEMAND

Demand is a powerful driver for innovation. If there are clear signals that consumers want to adopt lower-carbon products, greenhouse gas emissions will become the new principle on which firms compete. Entrepreneurs will seek out new technologies in the hope of gaining competitive advantage and market success. For example, where once companies innovated to make cars accelerate more quickly, they may in the future compete to develop cars that run more efficiently – so that the locus of competition will switch from speed to full efficiency.

Of course they will also be presented with the standard challenge of innovation: the risks and uncertainties that surround the

process of creating the right product at the right time and at the right price. Some will succeed, and some will fail.

Latent demand

Companies can create markets if they correctly read the consumer signals. One way to do this is to use new technologies to foster demand that is already latent, something Sony achieved with their Walkman. From the invention of radios in the 1920s through to the 1970s, listening to the radio was a collective experience. When Sony brought out their Walkman, they added a new dimension to listening – personal music that travels with you. This was not so much satisfying an existing want as leading people to realise they had a new want. And the result led directly into the distributed music revolution that we have today, with portable, downloadable music, all alongside the traditional ways to listen. Some low-carbon products could well follow the same path.

Government incentives

Governments can also play an important role in stimulating demand for low-carbon products, particularly in cases where low-carbon technologies face market obstacles. Subsidies or tax incentives can help to shift price-based competition in favour of low-carbon products. For example many different countries have provided subsidies or fiscal incentives for biofuels, which has stimulated demand and in turn provided incentives for biofuel producers to innovate.

Anticipating regulation

Another way for governments to stimulate demand is by introducing regulations or standards, based on performance criteria that are clear, universal, and predictable so that businesses can plan and invest effectively. Anticipating such new regulatory regimes can be extremely

² www.addressfp7.org/





profitable. One excellent example came in the early 1970s, when the US passed laws demanding that the car exhaust emissions that cause smog be reduced by 90% in just a few years. The car companies did their best to fight the legislation, but British precious metals company Johnson Matthey saw an opportunity. They quickly set up a collaboration with an engineering company that had facilities to test car engines, and then set about designing a catalyst – made in part from one of their products, platinum – that could do the job. When companies such as GM and Ford tried to tell Congress that the targets were

impossible, Johnson Matthey moved in with their new catalyst and showed how it could be done. The subsequent demand was extraordinary. Almost every new car in the world now bears a catalyst based on that original design.

Procurement

Governments are major customers in the economy too – the UK government has a procurement budget of £125 billion per year – and how they choose to spend this could help create demand for new technologies. For example the City of Hamburg has installed energy-



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saving lightbulbs for more than 400 public buildings throughout the city. The programme cost €19.3 million but saves 17 tonnes of CO₂ per year, as well as cutting nearly €4 million each year from the city's energy costs.

Carbon pricing

A robust, long-term price setting mechanism on carbon emissions, whether through direct taxation or cap and trade schemes, would certainly help to stimulate demand for lower-carbon products and services. This could be even more effective if it were possible to tax goods based

on their embedded carbon content. However, for this to be effective we would need reliable international standards for measuring the emissions embedded in products and services (see section 4.3).

4.6 INNOVATION, ADOPTION AND BEHAVIOUR

Even if a low-carbon innovation comes with considerable advantages it can still languish on the shelf while consumers continue with their old, high-carbon ways. One way round this is to focus on innovations that are essentially invisible to the consumer.



Invisible innovations

Some innovations could be essentially invisible to consumers in the sense that they do not entail radical shifts in consumer habits. The legal obligation to replace CFCs in refrigerators with new, ozone-friendly alternatives, as enshrined in the Montreal Protocol, required significant innovation from producers, but consumers scarcely noticed the difference. The same could be said of solvent free paints and the elimination of volatile organic compounds in the manufacture of printed circuit boards.

Invisible innovations are crucial because they don't require customers to make trade-offs which compromise the utility, performance or value of a product. There is no point in reducing the carbon impact of a product if you also reduce its intrinsic quality, as consumers will simply switch to an alternative (which may be higher-carbon).

In 2007, PepsiCo performed a full lifecycle analysis on its UK brand Walkers Crisps. Walkers became the first product to adopt the Carbon Trust Carbon Reduction Label, and also the first to meet the Label's two-year reduction commitment – delivering a 7% carbon reduction across its supply chain by 2009. The 7% reduction was driven by a powerful internal efficiency drive, including a 22% reduction in electricity use, an 11% reduction in gas use, and a 5% reduction in distribution fuel use. But the lifecycle analysis also encouraged Walkers to focus on their farmers and suppliers, with packaging lightweighting and changes to potato transportation also lowering their supply chain footprint.

Another example of this is Refrigerants, Naturally!, a global initiative of companies committed to substituting existing refrigerants with ones that occur naturally and cause little or no harm to the environment. Many refrigerators

used in storage, transport and retailing of chilled products use fluorinated gases ("F-gases", such as HCFCs and HFCs) which were introduced to replace gases that were harmful to the ozone layer. However F-gases turned out to be extremely potent greenhouse gases that can be hundreds or in some cases even thousands of times worse than carbon dioxide. For some retailers F-gases can make up to 20% of their direct footprint (Carbon Disclosure Project, 2008). As part of Refrigerants, Naturally! consumer goods companies such as Unilever, Pepsico and Coca-Cola are working on different technological options. For example by 2009, Unilever had replaced the refrigerants in nearly a quarter of its 2 million units, and the company has now expanded its programme from Europe into China and the US.

Disruptive innovations

There are also plenty of potential innovations that would disrupt both producer and consumer alike. These could be particularly useful in cases where high-carbon ways of behaving and infrastructures have become "locked in". For example, when cars were first invented, the internal combustion engine was just one of several alternatives for moving the cars around, and oil-based petrol only one of several fuels. Now, however, this high-carbon means of transport is deeply embedded in consumer culture, supported by major commercial interests and has become a highly politicised component of government policy. This raises the major challenge: how do innovations emerge to provide an escape route from locked-in systems?

The answer could be to find deliberate ways to disrupt the old system. In the case of cars, lower-carbon alternatives such as electric vehicles will require both major investments in the technologies and potentially a significant change in

consumer behaviour and the supporting infrastructure. Retailers can play a part here too, for instance by providing charging points in supermarket car parks to foster adoption of the new technology.

Government schemes can also provide new context for adopting low-carbon innovations. For example congestion charging schemes stimulate consumer demand for exempt vehicles. High-carbon technologies can remain locked in because of trade and other subsidies that were developed for historical reasons, but that mitigate against lower-carbon alternatives. For example, in 2005-06 the Australian Federal Government subsidised fossil fuels for use in energy and transport by over \$9bn (Riedy, 2007).

Innovations in lifespan

One way to produce lower carbon goods is to extend their lifespans. However, though there are those who decry a “throwaway” society, replacing old goods with new ones need not be damaging to the environment. Older cars become less efficient; older fridge units frost up more quickly, and their seals begin to lose holding power. There is a point in the life of many objects where the emissions cost of creating a new one is more than balanced by the emissions cost of running the old one at lower efficiency. To date, devices built into products to say when they should be replaced – for example the stripe that gradually wears out in toothbrushes, or a colour change in a water filter – have generally been based on efficacy. But there is no reason why a similar approach couldn’t be used to minimise the associated emissions, ensuring that we replace old items at the moment when the environment can benefit most.

CASE STUDY:

Grupo Bimbo

Grupo Bimbo, the world’s leading baked goods company, has reduced its energy use by nearly 13% over the past seven years by fitting many of its facilities with solar water heating systems, solar domes and skylights to provide natural lighting.

Taking a step further in the efforts to cope with climate change, the company invested 20% of the economic savings of the energy efficiency program, creating the environmental NGO Reforestamos México, which promotes the conservation and recovery of forest areas in Mexico. Since 2002, 39,105 hectares have been under conservation, nearly 7 million trees planted, and 5,241 hectares reforested.

Reforestamos also developed the first Mexican carbon calculator (www.reforestamosmexico.org/CO2) with an average of 200 visits per day and more than 60,000 users from 11 countries. The Grupo Bimbo School Visits Program has also run workshops, handed out brochures, and distributed copies of Al Gore’s climate change video “An Inconvenient Truth”. Three of the eight Mexican volunteers trained by Al Gore give climate change conferences creating awareness among 2,800 people.

The innovations described in this section show how businesses can overcome one of the barriers mentioned in Section 3: lack of availability of low-carbon alternatives. However, these innovations will have little effect unless consumers can also be persuaded to adopt them, and change their own behaviour in the process. The remaining barriers cited by consumers are lack of information, price, and a feeling that individuals can make little difference to the scale of the problem. The next section describes how to overcome these barriers – and more – using a set of tools that, taken together, can empower consumers to act on climate change.

5. EMPOWERING CONSUMERS



Old habits die very hard. Consumers are not homogeneous: they come with baggage in the form of tastes, social influences, aspirations and attitudes that add up to a series of deeply ingrained practices. These can vary from nation to nation, socio-economic group to group and even from one individual to the next. For instance, one study showed that within a single block of flats in

China, the amount of energy used for air conditioning different flats varied by more than a factor of three. The reasons were varied. Some people spent less time in their apartments; others had recently returned from America, where they had caught the habit of living in a cooler environment; some simply liked it hot (Zhao, Zhu and Wu, 2009).



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In order for technological innovations to succeed, companies are often required to spot opportunities at an early stage and to implement effective marketing strategies. A recent report found that even then, it can take a considerable amount of time for mainstream consumers to adopt new technologies (WBCSD, 2008).



SUMMARY

Action to tackle emissions in the supply chain is vital, but will not be enough on its own: consumers need to be empowered to choose the best products and use them effectively. To maximise the power of consumers in tackling climate change, we need a three-part revolution:

(A) Removing individual barriers

The first step in empowering consumers is to remove the individual barriers they face when trying to make low-carbon choices:

- **Price** – providing cheaper options and incentives;
- **Information** about the impact of consumer choices on climate change;
- **Hopelessness** – individuals are not acting alone.

(B) Changing the social context

However, individual strategies are not by themselves enough. The choices we make as consumers are affected not just by the products we find in a store, but also by the cultural context in which we live. Low-carbon choices, products and actions must become the social norm by:

- Using taste-makers, early adopters and consumer champions to make low-carbon fashionable;
- Instilling low-carbon habits at work and explaining how these can be applied at home;
- Promoting carbon numeracy in schools and among the young, so they can influence their households and be the low-carbon generations of the future;
- Encouraging low-carbon advocates and adopters to communicate and support each other via virtual and real low-carbon clubs and communities;
- Developing community-wide strategies to reduce carbon emissions.

(C) Adapting the material context

Low-carbon choices must also be integrated into our lives. It is not enough simply to substitute a high-carbon product with a low-carbon one. We also need to consider the context in which the goods will be used. Goods and infrastructure are interconnected and need to evolve consistently by developing low-carbon products in conjunction with each other and getting the infrastructure right.

Using all these strategies together will put consumers at the heart of the fight against climate change. The prize is a powerful and well-directed movement for change – a consumer-driven revolution in low-carbon consumption.

Understanding people's behaviour when they consume things is harder than it looks. Social scientists talk about two main aspects of a consumption practice: the outcome it produces for the consumer, and the process used to create that outcome. For example to get the outcome of feeling pleasantly full after a meal might require the process of cooking all afternoon, going out to a smart restaurant, or stopping off at a kebab shop.

It might seem that the objective of changing behaviour is to persuade people to deny themselves the outcomes in a process of retrenchment. But even if we could do this, which is doubtful, we might not want to. To achieve the dramatic emissions reductions we need will take a dynamic, forward-looking economy that can experiment and innovate. However, we can look hard at the processes that create those outcomes and try to make them lower-carbon. Importantly, this does not just involve providing lower-carbon products; it also means changing the way people use products and services.

Changing contexts

Though changing ingrained habits is not easy, the good news is that we already know a great deal about how to do it. This is important because our habits are the strongest driver for how we consume.

If we are to encourage consumers to break old high-carbon habits and make new, low-carbon ones, we need to view their activities in their different contexts. The three most significant contexts are individual, social and material.

To understand what these are and how they fit together, take the case of laundry. The individual context covers the products that consumers buy, and the way they use them. They can choose to buy a high or low efficiency washing machine, and then to buy concentrated powders or liquids or

ones that are heavy in packaging. At home, they can choose to wash a half load or wait until the machine is full, or to wash at 30°C or 60°C.

The social context reflects the influence that social aspirations and lifestyle have on the practice. Consumers that might once have worked in a factory and worn the same clothes several days in a row could now work in an office and change their shirts every day. Perhaps they might go for a run at night, and then change into a third set of leisure clothes. From needing to wash one set of clothes every several days, they now need to wash three sets a day.

Finally, the material context reflects the available technologies. It applies literally to the material the clothes are made of, which allows them to be washed more or less frequently, but also to the availability of labour-saving washing machines and powders.

When seeking ways to influence people's habits, it can be tempting to consider only one of these contexts. However, to influence not just the products that people buy but how they use them, it is essential to look at all three. Here, we will show how these contexts can fit together to help consumers kick the carbon habit.

5.1 INDIVIDUAL CONTEXT

As mentioned in section 3.4, when asked why they refrain from choosing lower-carbon products and services, consumers tend to cite price, lack of information and the lack of availability of environmental alternatives. The challenge for the consumer sector is to find ways to address all three of these barriers.

Price and incentives

Getting the price right or finding the right incentive – such as retail rewards, or enhanced quality of the experience – can encourage consumers to substitute good (low-carbon) products for bad (high-carbon) ones, or change the way they use products, such as recycling items instead of simply throwing them away.

For instance, when Tesco cut the price of low-energy lightbulbs by more than half, there was an immediate surge in sales – UK stores sold more of these lightbulbs in one week in 2009 than they did in the whole of 2006, and they have now sold over 20 million worldwide.

Price can also be used to penalise high-carbon practices, although this may not be as successful as providing low-carbon incentives. In 2002 Ireland imposed a nationwide charge on each disposable carrier bag.³ The Irish levied a 15 cent (euros) charge per plastic bag and achieved initial success with a 90-92% reduction. However, once consumers became used to the charge, plastic bag usage began to rise, requiring a further increase in the charge levied to 22 cents.

By contrast, companies in the UK adopted an approach using incentives rather than penalties. For example, Tesco offered one 'green' loyalty point (worth about €0.012) for each bag not used. (The company also ensured that people had to ask for bags at the checkout rather than being given them automatically.) The net result was a 50% reduction on plastic bag consumption in the UK. This has saved the need for three billion bags so far, or the equivalent to 35,000 tonnes of CO₂e per year.

**CASE STUDY:
Media-Saturn Group**

In 2007, the Media-Saturn Group embarked on a large-scale campaign to promote energy efficient electrical appliances. The idea was to convince consumers that they could help in the fight against climate change while also saving money.

The German Energy Agency trained employees to explain to customers how to use the European energy label to identify climate-friendly refrigerators and washing machines. To overcome one of the biggest purchase barriers – the higher price – Media Market and Saturn held “Energy Saving Weeks” and offered €100 gift certificates to customers who bought an A+ refrigerator. Data from the market research institute GfK Group shows how well the campaign worked. Today 50% of refrigerators sold in Germany have energy ratings of A+ or A++, which is the highest level in Europe.

The Tesco example represents a sustained but slower rate of decline in plastic bag usage. Given that sustained change is necessary to tackle climate change, this example suggests that incentives are at least as effective, if not more, than penalties. The relative impacts (i.e., price elasticities) are revealing. In Ireland, a penalty of 15-22 cents resulted in a 90-92% reduction, whereas in the UK a much smaller incentive of 1.2 cents caused a 50% decline.

It's also worth noting who benefits from each of the above situations – and who pays. In the Irish case, consumers were forced to pay, and the government collected the money. In the UK loyalty points case, the supermarkets subsidised the cost of the bags, and the consumers

³See www.environ.ie/en/Environment/Waste/PlasticBags/



gained a little extra money for their shopping. In other words, consumers are not stupid. If you offer them an advantage in order to change their behaviour, they will probably take it.

However, incentives alone are not enough, especially when it comes to making long-term changes in behaviour. In Copenhagen in 2002-03, a study gave free one-month bus passes to 400 car-driving commuters. This helped to encourage a significant increase in the number of journeys made by bus rather than car. However, after the trial period the number of bus journeys declined and people largely reverted back to driving their cars (Thogerson & Moller, 2008).

The message we should take from this experiment isn't only that people "revert to type", but also that price incentives alone aren't necessarily enough to make people adopt new behaviour and stick to it. Equally, penalties can back-fire by legitimating bad practices. When parents at a kibbutz school were fined for turning up late to collect their children, the penalty did not discourage them. Instead the number of late pick-ups rose, because parents felt that they were paying for the right to be late (Gneezy and Rustichini, 2000). The same argument is sometimes levied against green taxes, which can create the impression that the additional payment off-sets the negative impacts of the practice. The bottom line is that it's good to offer incentives and that pricing can be effective, but we still need to be careful about how we use them.

Information

At present there is limited research on the effectiveness of information campaigns for encouraging low-carbon behaviour, but we can draw some important conclusions from our understanding of consumer behaviour in general. The most important is that information cannot be used as a blunt tool. For example, during the 1980s Californian utility companies spent \$200 million to advertise residential energy efficiency measures but household energy use didn't change. In one case, the Pacific Gas and Electricity Company spent more money advertising the benefits of home insulation in California than it would have cost to install the insulation directly into the homes of every person it was trying to reach (McKenzie-Mohr, 2000).

We know that social groups try to distinguish themselves from one another, so that information is most effective when segmented and focused. Some people will be encouraged to buy a product if it is portrayed as cheaper, but others will be reassured by the idea that a more expensive product is also better quality.

The Stockholm Environment Institute used marketing company MOSAIC's classification of UK households into 61 different groups, and measured the carbon footprint of each. They found that the biggest emitters had footprints three times larger than the smallest. But they also proposed creating effective marketing tools by combining this with information about the households' lifestyle choices: the type of house they live in; which charities they give money to; which paper they read; who they vote for. The information can even be mapped spatially down to individual postcodes.

CASE STUDY:**Nestlé Purina**

Nestlé Purina's US operation produces almost 3 billion aluminium pet food cans each year, but the aluminium industry estimates that only 15-20% of these are recycled. Since a can made of recycled aluminium saves up to 95% of the energy needed to make a can entirely from virgin ore, dumping these cans in landfill rather than recycling them means losing the opportunity to save more than 250,000 tons of greenhouse gas emissions.

The company therefore decided to tell their customers more about the benefits of recycling. They are currently adding various "did you know" facts about the benefits of recycling aluminium cans on certain packaging formats, such as multi-packs, as well as on brand websites, print advertising and free-standing inserts. For example, "did you know" that recycling a 5.5oz aluminium pet food can saves enough energy to power a 60-watt light bulb for over three hours? Fancy Feast and Friskies, the largest wet cat food brands in the US, are also partnering with major retailers to launch a national Earth Day promotion in 2010, which will highlight recycling of pet food cans.

The company is also seeking ways to provide an incentive to recycle. In late 2008, they launched a regional test partnership with RecycleBank to provide consumers with a strong incentive to recycle wet pet food cans. Through the RecycleBank programme, households earn points for their recycling efforts, and they can use those points for rewards and discounts with more than 900 regional and national partners. RecycleBank is currently operating in 15 states and has an aggressive expansion plan for 2010. Already, it has seen recycling rates in participating communities triple.

A UK Government study looked in detail at consumer behaviour, segmenting people into different groups according to their willingness and potential to act (Defra, 2008). The study showed that the benefit of using a segmentation model was in assisting tailored approaches for specific groups. Segmentation makes it possible to identify issues and opportunities, based on an understanding of each segment's attitudes, barriers, motivations and current behaviours. It means, for example, we understand which groups are most sceptical about their behaviour contributing to climate change or where most people are already actively seeking to influence their friends and family to be more environmentally friendly. This means that marketing campaigns can be targeted in order to maximise their effectiveness.

Campaigns can also be coordinated between different players, and targeted to a particular behaviour. A body of evidence is growing (including Defra, 2008) about those behaviours that have the biggest impact, are easiest to achieve, and are best understood by different societal segments (with not all behaviours ticking all those boxes). Examples include: wash at a low temperature; switch off appliances when not in use; install insulation; waste less food; fly less.

The "wash at a low temperature" example addresses the fact that emissions associated with domestic clothes washing depend very strongly on the temperature and volume of water used. P&G partnered with a range of organisations such as the Energy Saving Trust in the UK where it ran a "Turn to 30" consumer education campaign to encourage people to wash their clothes at 30 degrees. The campaign used TV and print advertising as well as information provided on-line and on the washing products.

Continued on page 48



ENVIRONMENTAL LABELLING

SEAL OF APPROVAL

In this category of label, an independent body assesses the product from an environmental perspective and assigns a stamp of approval. The world's biggest and most widely recognised labels in this category are:



ENERGY STAR is a voluntary labelling scheme begun in 1992 and run by the Environmental Protection Agency

(EPA) and the Department of Energy in the US. It denotes energy efficiency, and by 2006 covered 50 product categories, and 300 million purchases per year.



BLUE ANGEL is the most widely accepted environmental label in Europe. It is multi-criteria, spans many product categories

and is particularly well recognised by consumers in Germany.

These are among the oldest environmental labels and do not necessarily incorporate carbon emissions. However some schemes such as Climatop in Switzerland are now integrating lifecycle carbon emissions into their criteria, while others are considering doing so.

COMPARE AND CONTRAST

This type of label compares individual products within a category according to their environmental impacts. One of the earliest and most successful of these was the EU's energy efficiency ratings for electrical appliances. The mandatory scheme put appliances into bands from A to G based on their energy efficiency, and caused such a significant shift in both consumer demand for more efficient appliances and manufacturers' provisions to meet that demand that it was subsequently extended to A++.

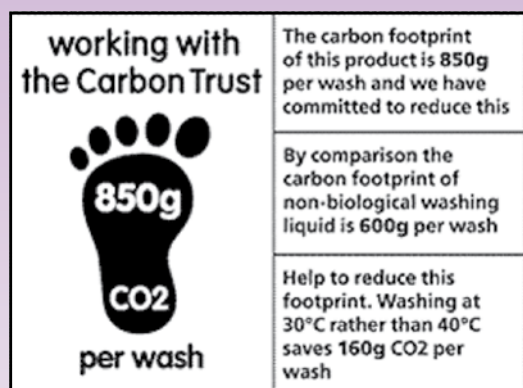
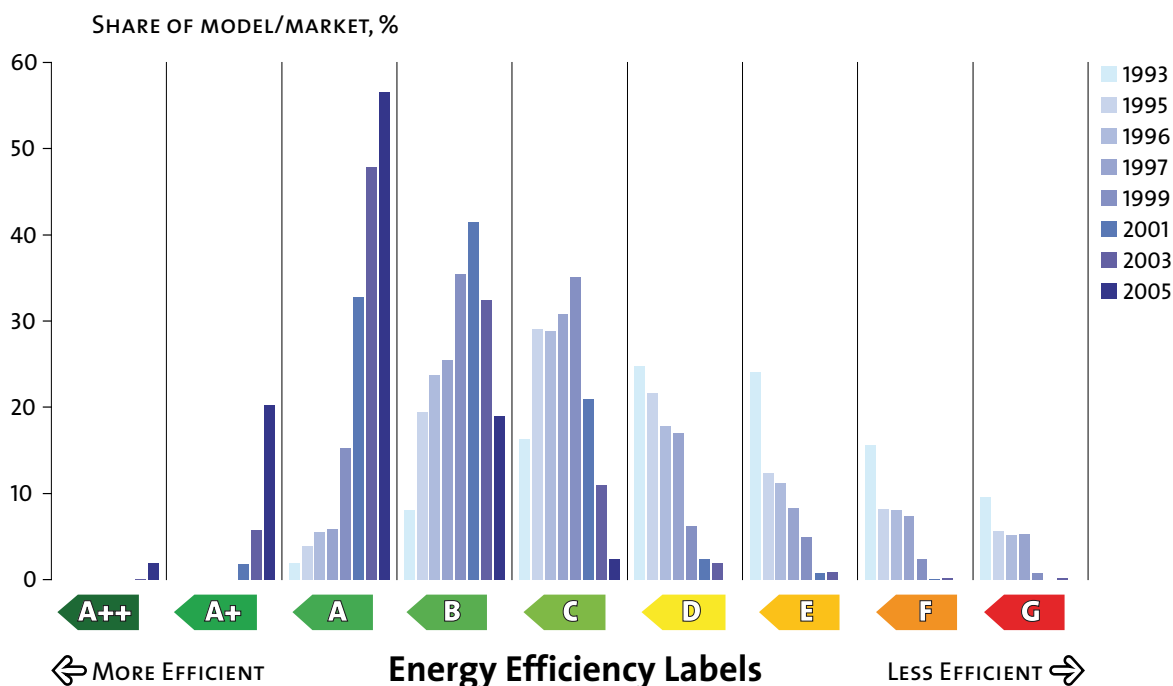
CARBON FOOTPRINTING

Many companies are now looking into the potential benefit of sharing lifecycle emissions information with consumers. These are early days, but the first indications of consumer responses are now being studied. This has also proved an area for intense debate and controversy. While some retailers and product manufacturers say that carbon footprinting could be an effective way of helping consumers make informed choices as they seek to move to lower-carbon lives, others insist that it is still too early, or that labelling individual products is unwieldy, impractical or misguided.

Time will certainly tell; but for the moment, the search is on for a way to convey lifecycle emissions that is simple, reliable, useful, comparable and credible for consumers. There are several early contenders:

FIGURE 13:
The impact of the EU Appliance Label (A++ to G) on the market of cold appliances in EU-25.

(IPCC, AR4, WG3, Ch6o)



CARBON TRUST CARBON REDUCTION LABEL has been applied to several hundred products from bread to bricks. The example shown here is from a Tesco own-label washing detergent. Note that the label carries the certification authority of the Carbon Trust as well as a commitment by Tesco to reduce the footprint of the product. The Trust label also includes comparisons with similar products (non-biological powder in this case) and suggestion for what actions the consumer can take to reduce the footprint – washing at 30°C saves 160g (19%) per wash.



GROUP CASINO L'INDICE CARBON: By Spring 2009, French retailer Casino had footprinted 200 own-label food products. The label provides not only the estimated product footprint for a 100g helping but also a comparative scale so consumers can see if the product is a high or low-carbon intensity food.

SOUTH KOREAN GOVERNMENT: In 2009 the South Korean Ministry of the Environment started working with retailers such as Tesco Homeplus and branded label manufacturers to promote a carbon labelling scheme. Over 20 products are now labelled in Tesco stores in Korea, including milk and rice. The Ministry is also promoting a scheme to provide carbon emissions information for the use phase of electrical appliances such as televisions.



MAX FAST FOOD CHAIN in Sweden announced in 2008 that it had put detailed information about the carbon impacts of its products onto its menus. Consumers can for example choose between a cheeseburger (0.9kg CO₂) and a chicken burger (0.3kg CO₂).

CASE STUDY:**Migros**

Migros, a co-operative of manufacturers and retailers in Switzerland, provides convenient recycling facilities in every store to help customers. As part of its ongoing drive to improve recycling levels, Migros set up an initiative in 2008 linked to Walt Disney's animated film "Wall-E". The initiative was run jointly with various recycling organisations with which Migros had already been working for up to 20 years. The partnership published a consumer recycling guide, "Help Wall-E", which they handed out in cinemas and made available online.

In 2008, customers brought more than 13,000 tonnes of waste for recycling to Migros stores, including 8,700 tonnes of PET beverage bottles. This means that almost 90% of the PET beverage bottles bought in Migros's stores were subsequently recycled.

Migros also made direct use of the recycled material, putting more than 1,500 tonnes of the PET recyclate into its own-label water bottles, thus saving around 7,000 tonnes CO₂ equivalent of greenhouse gases.

P&G's washing powder brand, Ariel, also used celebrities and sustainability thought leaders as well as an interactive website that offered advice about sustainable washing practices that encouraged readers to spread the word. The results were impressive. In the UK, for example, in 2002 only 2% of consumers were washing at 30°C; by 2007 that had risen to 17% on average and 27% for Ariel users (IPSOS Habits and Practices Studies, 2002 and 2007).

Carbon labelling can also be an effective way to communicate the embedded, use and disposal emissions associated with particular products or services to individuals, providing that we can devise a reliable set of standards (see page 47).

Availability of alternatives

To address this barrier, we need to make low-carbon goods and services easier to find and adopt. In part, companies need to provide more low-carbon alternatives, as discussed in Section 4. But strategies to make existing products more visible or easier to adopt could also help. Although it did not address low-carbon products per se, Tesco learned a useful lesson with its organic products. When the company moved these products from a specialist "organics" area to integrate them with all the other produce, choosing organic became easier. As a result sales of organic produce rose by 35%.

Each of these approaches can help considerably with changing individual behaviour, but as we mentioned above, they cannot be taken in isolation. There are two important problems that illustrate why we cannot afford to stop our efforts at the level of the individual consumer:

- **The free-rider problem:** Even if we believe we are making choices at an individual level, each of us is also influenced by the behaviour of those around us. If we see

CASE STUDY:
Unilever and ASDA

In 2008 Unilever launched the 'Family Kitchen' programme with ASDA in the UK to communicate directly with shoppers about the difference that they can make to their families' wellbeing and to the environment.

The programme was developed on the basis of consumer research that showed that UK shoppers wanted to make the right choices for their families and for their environment but they had to balance that with getting value for money and with choices that were relevant to their lives.

Centred on a physical mock-up kitchen located at the store entrance the programme educated consumers, through useful tips and suggestions, on the impact that simple choices such as turning off electrical

appliances can make. Products with lower environmental impact or health and wellness benefits were included in the kitchen and were promoted in-store offering an added financial incentive for shoppers to make the 'right' decision and engage in environmentally aware behaviour.

Linking the in-store programme with direct mail and a widespread local media and PR programme help raise wider awareness and, therefore, more commitment across shoppers and consumers.

A 'Family Kitchen' was also installed in the foyer of the retailer's head office to raise awareness and educate within the company.

The shopper response to this initial programme showed that they valued the tips and advice received through the Family Kitchen and felt empowered to make a change. By offering immediate incentives the programme reinforced the behavioural change.

that other people are not playing their part, we are less likely to act ourselves. The tipping point for reusing plastic bags came when the practice was sufficiently widespread that individuals saw it was making a difference.

- **Rebound effects:** These occur when adopting low-carbon behaviour in one area allows more high-carbon behaviour in a different domain (Sorrel, 2007). If people save money on energy bills, will they spend the money saved on a high-carbon holiday? Or if we insulate everybody's homes, will they then grow accustomed to living indoors at a higher temperature? A study performed by The Stockholm Environment Institute for the UK's Department for Environment, Food and Rural Affairs showed that between

1992 and 2004, products became so much more carbon efficient that the UK's carbon emissions should have fallen by nearly 150 million tonnes (which would have been a 25% reduction in emissions). However this effect was swamped by a corresponding increase in the amount each household spent, which raised emissions by 250 million tonnes.

For reasons such as these, it is not enough to focus on changing behaviour solely at the individual level. We need to look at the broader social context.

5.2 SOCIAL CONTEXT

Though we are seldom conscious of it, more or less every form of consumption – eating, cooking, washing, travelling, entertaining ourselves and others





– is guided by cultural conventions. For instance, as societies develop and grow richer, time pressure becomes a greater driver of how we eat – leading to greater demand for pre-prepared ready meals (Warde, 1999), eating out (Cheng et al, 2007) and to more refrigeration in the home (Shove & Southerton, 2000). This doesn't just apply to western societies. One study has seen a similar effect in Indian families as they change from extended family to nuclear family structures and as more women go out to work (Wilhite, 2007).

If we are to succeed in encouraging people to change to a lower-carbon lifestyle, we

will need to intervene in these wider social frameworks. For example, an employer could coordinate the work times of employees to encourage car sharing. Other business practices, such as changing the amount and kind of travel, or instigating energy-saving and recycling at work, may also have a knock-on effect outside the workplace. One example of this is “CO₂-monitor”, an online tool launched in 2008 as part of a partnership between WWF, Migros and other Swiss companies. Since private households account for two thirds of CO₂ emissions in Switzerland, Migros encourages its employees to use CO₂ monitor to record their personal emissions, and follow goals for reducing them.



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Schools could be another useful target. After all, upcoming generations have most to gain or lose by action or inaction on climate change, and the class of 2009 will be the parents and leaders of 2030. Just as promoting healthy eating in schools has longer term effects on eating habits, so reaching out to younger children could help encourage low-carbon habits from an early age. Education campaigns have typically concentrated on energy use and transport and have only rarely considered other forms of consumption. Several consumer goods companies recognise this (and the associated brand benefits) and some have embarked upon direct climate change education initiatives. For example,

since 2008 Unilever and Tesco Kipa have jointly run a schools education programme in Turkey, with materials to support understanding of global warming and the steps that people can take to combat it (Oyunlu Kuresel Isinma Kitapcigi).

Influencing tastes

Taste is another very significant driver of consumer behaviour – both in the sense of what we like to consume, and what we consider to be appropriate behaviour. One of the most effective ways to leverage people’s tastes and therefore encourage them to take a low-carbon direction is to use so-called “taste-makers”. These are people whom certain sectors of society or



even whole societies admire and look to, sometimes unconsciously, for guidance. In Europe and the US, for example, celebrity chefs have made a significant difference to the eating aspirations of large sectors of the population. Similarly, media presenters in the UK have an important influence on people's aspirations for driving fast (and carbon hungry) cars. As we mentioned above, the use of celebrities in Ariel's "turn to 30" campaign seems to have made a significant difference.

However, one taste-maker doesn't fit all groups. Consciously or unconsciously, we define our tastes according to two important criteria. First, we tend to copy people whose status we aspire to – such as celebrities or people in a higher social class. Second, we tend to adopt certain ways of behaving to distinguish ourselves from groups who we consider to be vulgar or in poor taste.

To influence peoples' taste effectively, we therefore need to understand who will be the most effective advocates of a low-carbon lifestyle for different groups. Although case studies focusing on carbon are lacking, consumer goods companies have very considerable experience in targeting their messages according to the most important determinants of group tastes: age, class, gender, lifestyles, ethnicity, social networks, whether a group is made up of people with little time to spend, or plenty of time on their hands. This sort of targeted taste-making is a very real strength of the consumer sector that could readily apply to the climate change problem.

Another good way to change tastes is to target 'early adopters' or consumer champions – people who tend to be enthusiasts for a particular product or practice. Their enthusiasm encourages them to pay higher prices to be ahead of the pack, which helps to stimulate

demand. But their early adoption can also influence the behaviour of those around them. Think of the gastronomes who, in the 1970s, championed eating lamb and duck when it is pink rather than cooked through, creating a demand for a way of cooking that has since become the mark of good taste in restaurants (Warde, 2009) and enthusiast groups who design, test and refine computer software before it reaches the wider market (Rutter & Bryce, 2006).

Advocacy groups can also be effective consumer champions. For example in the UK, CAMRA (the Campaign for Real Ale) and the Slow Food Movement have both had a significant impact on the country's eating and drinking habits. In fact, CAMRA is widely credited with rescuing locally brewed ales from obscurity by stimulating demand (Davison, 2003).

Similarly, enthusiasts and consumer champions who can cultivate new tastes and stimulate demand for low-carbon consumption should have significant potential for changing consumer behaviour.

Community-based initiatives

Many studies (e.g. Sustainable Development Commission, 2006) show that community-based initiatives can be an effective way of changing people's attitudes. Such communities might be based around a particular place, but could also involve groups of people with shared interests or activities, such as a sports club or a community of users of a website.

For example, in 2000, Nova Scotia province in Canada introduced a community-based initiative to encourage composting. The first step was to contact all households and ask whether they composted, and if not, if they would consider doing so. Households who composted were then asked to put a sign on the household bin

CASE STUDY:**Unilever**

Unilever research showed that up to 95% of its laundry product water footprint and depending upon the market, between 25 and 70% of its greenhouse gas footprint occurs during consumer use. Part of their strategy was to launch new detergent formulas that encouraged consumers to use shorter cycles, lower temperatures, less rinsing and no pre-wash.

In addition, Unilever knew that creating a liquid detergent that fits into a bottle one third of the size was an excellent way of reducing the environmental impact of a brand. Concentrating the same number of washes into a bottle one third of the size means one third of the packaging, water use and transport compared to diluted liquids. The European Small & Mighty campaign (Persil in the UK) was first communicated through PR, followed by a “Pop-up Book” advertising campaign which explained the packaging, water and transport savings in a simple and engaging child’s narrative. Small & Mighty has helped Unilever considerably reduce the environmental impact of its detergents in Europe. 29.7 million units of DiG Small & Mighty were sold in 2007, saving 33 million litres of water, plastic equivalent to 262 million shopping bags and 665 tonnes of CO₂.

Unilever realised that by deepening their understanding of consumers’ motivations and barriers to behaviour change, they can produce better products and the best possible advice to encourage good laundry habits. In addition to qualitative research, unique loggers and water sensors are being placed in products, washing machines and water pipes to track product usage, dosage, water consumption and water temperature in some interview respondents’ homes. The technology gives Unilever a detailed understanding of how best to monitor the many types of behaviour involved in laundry and adapt their products accordingly.

which neighbours would see when bins were placed in the street for kerbside collection. They were also asked to speak to their neighbours and friends about composting and to dispel common fears that it was unpleasant. In a follow-up survey seven months after initial contact, 80% of households who didn’t compost but were prepared to consider it had taken up the practice (McKenzie-Mohr, 2000).

Another good example of community-based action is the Ecoteam programme run by Global Action Plan in more than 20 countries since 1990. A small group of six to eight people met once a month for five months to develop ideas about how to live more sustainably, and to encourage each other to follow the ideas through. A study in 2004 (Staats et al, 2004) showed that environmental habits had stuck even several years after the five-month period was over. Although it’s true that volunteers to the programme are already motivated to change their behaviour, this suggests that community-based schemes could help both to engage consumers in sustainable behaviour, and to ensure that they maintain it.

Though schemes such as this are necessarily focused on small groups, one way to reach wider communities would be to provide rewards for the community – such as equipment for a local club – as an incentive for sustainable behaviour. Another possibility would be to use noticeboards or set-aside areas in retail stores to encourage local projects for sustainable consumption, or to develop virtual networks such as web-based forums for discussing how to reduce the carbon footprint of shopping bills.



5.3 MATERIAL CONTEXT

Influencing the social context in which people make decisions, however, is still not enough in isolation. Just as important is the material context – in other words, the range of technologies and infrastructures that are available to us as we decide what and how to consume. Unless the right combinations of products, services and infrastructure are available, consumers will be unable to act. Section 4 has already described new low-carbon technologies in detail. Here, though, are some examples of how getting the technologies right can have a direct influence on people's behaviour.

Goods are interconnected

When you buy something, it's rarely in isolation. There's no point in looking for shower gel or a shower cap if you don't have a shower. Similarly, when people buy a dishwasher they often also buy new cutlery and plates (Hand & Shove, 2004). Buying something new can even change the way people use existing items. For example, the advent of microwave ovens meant the development of frozen ready-meals, which in turn changed the main use of freezers (Shove & Southerton, 2000).

This means that for a new product to be successful, it has to be designed in the context of the products that will be used alongside. Getting this part of the material context wrong means that even a good idea can fail. For instance, the early attempts at e-commerce during the dotcom boom foundered because there simply weren't enough home computers or broadband connections to make it viable. Years later, now that the computers and connections are finally in place in many countries, e-commerce is taking off.

This applies just as much to products and services designed to combat climate change. It's not enough to design one item

on its own. Changing people's behaviour means developing ranges of goods that together support a low-carbon lifestyle.

Technologies come with 'scripts'

Some technologies carry in-built "scripts" that can directly influence people's behaviour. For example, in many hotels it is now necessary to insert the key card into a slot before the lights will come on – making it effectively impossible for guests to leave lights on when they're not in the room. This opens up the intriguing possibility of designing a similar "script" into other objects to ensure they will be used in the most low-carbon way. This could be particularly important for areas such as the food industry and laundry, where the use phase of a product often contributes more carbon dioxide emissions than any other. For example, a washing machine could have default settings for low-temperature washes, thus encouraging the low-carbon behaviour.

Is the infrastructure right?

The way infrastructures evolve locks people into practices that can be very difficult to change. For example, in 1970 only 3% of UK households owned a freezer, but by 1995 this figure had reached 97% (DECADE, 1997). That's not just because it's useful to be able to freeze things. The rise of the freezer came along with an entire frozen-food infrastructure that included the changing design of houses so that they no longer had larders, and shifting work patterns as fewer women stayed at home to shop and cook each day (Shove & Southerton, 2000). Another example is the rapid spread of air conditioning units in Kerala, India, driven by changes in house design from sloping-roofed buildings that were naturally ventilated to concrete flat-roofed buildings (Wilhite, 2007). Such technologies and infrastructures evolve together in ways that lock people into patterns of daily life. That's not necessarily a bad thing. However, to

change these patterns we need to find ways to “unlock” the old high-carbon practices and “lock-in” the new, low-carbon ones. And for that, infrastructure will be key. The city of Paris recognised this in 2007. To encourage more of its citizens to ride bicycles it didn’t just provide a suite of bicycles for hire – it also installed cycle lanes and storage racks around the city. The upshot was a 48% rise in cycling with over 42 million users since the scheme’s launch, less congestion and of course fewer car emissions (Vélib July 2009 newsletter).

5.4 PUTTING IT ALL TOGETHER

Deliberately changing habits is notoriously difficult. As this paper has explained, there are many individual strategies, but they work best when put together. We can’t count on simply substituting high-carbon goods for low-carbon, and nor can we expect price mechanisms and information campaigns to work on their own. To make the best possible use of the vast capacity of consumers to reduce greenhouse gas emissions, we need to find ways to incorporate all three of the contexts that we’ve discussed here.

In 1997, Durham Region in Ontario decided to try to reduce the water use of its residents. They chose two different test groups. The first group received a straightforward information pack telling them about how to reduce their water consumption. This is a very standard approach to changing behaviour: send information and hope for the best. Importantly, it addresses only the individual/information context described above.

For the second group, the Region tried a greater variety of approaches. This group received a visit by a student who explained the initiative in detail, as well as a sign to be hung on the outside water tap reminding them to water their

gardens only every other day, and not at all if had rained in the previous week. Both of these addressed aspects of the individual context (information), but more thoughtfully than the simple pack. It’s easier to ignore something that comes through your letter box than a person sitting on your sofa, or a sign that you see every time you go to water your lawn.

But the study went further. Since previous surveys had shown that people often didn’t know when they had watered enough, the second group also received a gauge that they could insert into their lawn to tell them when to stop (material context). Almost three quarters of the participants also signed a pledge promising to stick to their lower watering routine (social context).

The results were spectacular. The second group decreased its watering by 54%, compared to a slight increase in the “information only” group. There was also a 66% drop in the number of times a member of this second group watered the lawn for more than an hour at a time. (Again, for the “information only” group this figure actually increased.) The programme cost \$80,000 to deliver but saved the Durham Region \$945,000 (McKenzie-Mohr, 2000).

The message couldn’t be clearer. Information by itself is not enough. But when you put all the different contexts together you really can change people’s behaviour.

There are many other examples of how addressing all three contexts has made a difference to the way people respond, some of which are shown in Figure 14. Thinking this way also provides some clever new tools for encouraging people to act on climate change.



FIGURE 14:
Application of the behavioural contexts in practice (selected examples)

BEHAVIOURAL CONTEXTS				
	INDIVIDUAL	SOCIAL	MATERIAL	
Example practices and successful behavioural change efforts ↓	Information, incentives and pricing, subjective norms and ease of application	Institutional frameworks, cultural and social group relations	Technologies and physical infrastructures	Achieved Sustainable Outcomes
RECYCLING <i>Customer recycling of PET bottles (Switzerland)</i>	Information on pack and in stores Feedback of seeing products coming back made from the recycled material	Education programmes Link to local (our) environment Pressure groups active	Physical infrastructure to support returns in stores Technologies for capture, sort and processing materials	7,000 tonnes CO ₂ e per year saving from communities around Migros Swiss stores in PET recycling alone
LAUNDRY <i>Washing at lower temperatures (EU)</i>	Information widely available on products, in stores, online Special offers/ campaigns link to secondary benefits of greener products and behaviour	Advertising campaigns helping to unlearn practices that habituated high temperatures in washing	Reminders in clothing labels “wash me at 30” Detergent ranges that work at lower temperatures Machines with lower temperature settings	In the UK, people washing at 30°C or below up from 2% to 17% over 5 years
SHOPPING BAGS <i>Reduction in use in single use shopping bags (UK)</i>	Reward mechanism of loyalty points for use of alternative bags Price charged for bags as a dis-incentive	Advertising campaigns using celebrities to emphasise that it’s “OK” even “cool” to re-use Media campaigns	Availability of re-usable bag ranges Nudge-point at checkout process that puts small extra hurdle on use of new plastic bags	3 billion new plastic bags saved 35,000 tonnes CO ₂ e per year saving from communities around Tesco UK stores alone
“Not using bags has become the norm”				

Nudging: People's natural reluctance to change might seem like a problem when you're trying to achieve large-scale shifts in behaviour. But nudging is a way to convert this inherent inertia, judo-style, into part of the solution (Thaler and Sunstein, 2008). For example, supermarkets used to offer plastic bags automatically, and have them on view. Simply putting them below the counter and training salespeople to wait to be asked before handing them out considerably reduced the number of bags used. Nudging also affects the material and social contexts. In the case of plastic bags, for instance, nudging has also changed what people perceive as acceptable behaviour – it can be embarrassing to ask for a plastic bag, or be seen carrying one (the social context). It has also opened up a new material context in the provision of more durable plastic “bags for life”, designed for repeated use.

Life events: Thinking more cleverly about the context in which people live, work and behave also suggests that some points in life will make better targets than others. People are more susceptible to changing habits when their existing individual, social and material contexts radically change. Moving house, having a baby, getting married or divorced or retiring all tend to encourage people to rethink their habits and restructure their lifestyles. Target these moments, and you have a much better chance of locking in a new habit in place of the old one. One good example of this is a scheme in Pennsylvania, US, operated by the Centre Area Transportation Authority (CATA). This targeted people who had recently moved to a new neighbourhood, offering free bus passes for a trial period, and information about bus stops and services. While CATA did not directly evaluate the success of the scheme, they did report a significant increase in passenger numbers (to 6 million plus annual bus-riders).

Existing approaches to sustainable consumption tend to focus on only one small part of the picture. For example, they might put all their efforts into technological innovation, or assume that people choose what to buy based solely on what they see in the shop. Or, when these sorts of approaches fail, as they must, to make big changes in the way people consume, the next step is often to reach blindly for big government intervention and regulation.

While these approaches could well end up being part of the answer, if they are used randomly and in isolation they simply don't work. The bottom line is that we will never achieve a low-carbon future simply by switching new products for old ones. Consumer behaviour and the innovations that directly affect them are too dynamic for that. Rather, we need a new vision that incorporates all the levers and tools at our disposal, and uses them intelligently and in context.

The measures proposed here would help reduce greenhouse gas emissions rapidly, and on a truly global scale. This is essential if we are to tackle the carbon problem. But they also go further. They encourage economic growth, by stimulating demand for low-carbon products, which in turn stimulates innovation. Just as importantly, they show how we can work with people's wills rather than trying (usually in vain) to fight against them. The people who reduced their water consumption in Canada didn't feel as though they had made some appalling sacrifice – for them, the outcome was just as good.

Above all, we need to recognise the willingness of consumers to change, and give them the means to do so. Between these pages lies a conceptual and practical toolkit for creating a low-carbon revolution. The way is there. All we need now is the will.

REFERENCES

- Anderson K. and Bows A. (2008). 'Reframing the climate change challenge in light of post-2000 emission trends', *Philosophical Transactions A* 366(1882): 3863-3882.
- Barrett J., Minx J. and Wiedmann T. (2009). 'Environmental Impact of UK Consumption', *Environmental Policy and Planning*, in press.
- Beattie G., and Sale L. (2009). 'Explicit and Implicit Attitudes to Low and High Carbon Footprint Products', *The International Journal of Environmental, Cultural, Economic and Social Sustainability*, 5 (4):191-206.
- Boston Consulting Group global green survey (2008).
- BSI (2008). Guide to PAS 2050 – How to assess the carbon footprint of goods and services.
- Carbon Disclosure Project (2008). 'Carbon Disclosure Project Report 2008 - Global 500', Carbon Disclosure Project: London. https://www.cdproject.net/CDPResults/67_329_143_CD%20Global%20500%20Report%202008.pdf
- CBI (2007). Climate change: Everyone's business: 17.
- Cheng S-L, Olsen W., Southerton D and Warde A. (2007). 'The changing practice of eating: evidence from UK time diaries, 1975 and 2000', *British Journal of Sociology*, 58(1): 39-61.
- Cole M.A. and Neumayer E. (2004). "Examining the Impact of Demographic Factors on Air Pollution" *Population & Environment* 26(1): 1573-7810.
- Davison A. (2003). 'Campaign for Real Ale (CAMRA)', in J. Blocker, D. Fahey, & I. Tyrrell, *Alcohol and Temperance in Modern History*, Oxford: Abc-Clio.
- DECADE (1997). Transforming the UK Cold Market. Energy and Environment programme. Environmental Change Unit, University of Oxford.
- Defra (2008). A Framework for Pro-environmental Behaviours.
- Dietz T and Rosa E.A. (1997). "Effects of population and affluence on CO2 emissions." *Proceedings of the National Academy of Sciences* 94(1):175-179.
- Friedlingstein P., L. Bopp, et al (2001). 'Positive feedback between future climate change and the carbon cycle', *Geophysical Research Letters* 28: 1543-1546.
- Gneezy U. and Rustichini A. (2000). 'Pay Enough or Don't Pay at All', *Quarterly Journal of Economics* 115(3): 791-810.
- Greenwald, McGee and Schwartz (1998). 'Measuring Individual Differences in Implicit Cognition: The Implicit Association Test', *Journal of Personality and Social Psychology*, 74(6):1464-80.
- Hand M. and Shove E. (2004). 'Orchestrating Concepts: kitchen dynamics and regime change in Good Housekeeping and Ideal Home, 1922-2002', *Home Cultures*, Vol. 1 (3): 1-22.
- Hertwich E. and Peters G. (2009). 'Carbon Footprint of Nations: A Global, Trade-Linked Analysis', *Environmental Science and Technology*, 2009 (43): 6414-6420.
- IPCC (2007). Climate Change 2007: Synthesis Report, Fourth Assessment report of the Intergovernmental Panel on Climate Change.
- Lenton T.M., Held H., Krigler E., Hall J.W, Lucht W., Rahmstorf S., Schellnhuber H.J. (2008). 'Tipping elements in the Earth's climate system', *PNAS*, 105(6): 1786-1793.
- Lippincott (2007). Consumers, brands and climate change.
- Martin C. and Watson M. (2006). Measurement of energy savings and comfort levels in houses receiving insulation upgrades, Energy Saving Trust.
- McKenzie-Mohr (2000). 'Promoting Sustainable Behavior: an introduction to community-based social marketing', *Journal of Social Issues*, 56(3): 543-54.
- McKinsey and Company (2008). Pathways to a Low-Carbon Economy. Version 2 of the Global Greenhouse Gas Abatement Cost Curve.
- Minx J.C., Baiocchi G., Wiedmann T. and Barrett J., (2009). Understanding Changes in CO2 Emissions from Consumption 1992-2004: A Structural Decomposition Analysis. Report to the UK Department for Environment, Food and Rural Affairs by Stockholm Environment Institute at the University of York and the University of Durham, DEFRA, London, UK.
- Munasinghe M. (1995). 'Making Growth More Sustainable', *Ecological Economics*, 15:121-4.
- Munasinghe M. (2007). 'Making Development More Sustainable: Sustainomics Framework and Practical Applications', Colombo, MIND Press, Munasinghe Institute for Development.
- Munasinghe M. (2009). 'Sustainable Development in Practice: Sustainomics Methodology and Applications', Cambridge, Cambridge University Press.
- Nakicenovic N., O. Davidson, et al (2000). IPCC Special Report on Emission Scenarios, Cambridge, Cambridge University Press.
- Pacala S. and Socolow R.H. (2004). 'Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies'. *Science*, 305 (5686): 968-972.
- Peters G. P. (2008). 'From production-based to consumption-based national emission inventories.' *Ecological Economics* 65(1): 13-23.
- Raupach M. R., G. Marland, et al (2007). 'Global and regional drivers of accelerating CO2 emissions', *Proceedings of the National Academy of Sciences* 104(24): 10288-10293.
- Richardson K., W. Steffen, et al (2009). Climate Change, Global Risks, Challenges & Decisions Synthesis Report, Climate Change Scientific Congress, Copenhagen, International Alliance of Research Universities.
- Riedy, C. (2007). Energy and Transport Subsidies in Australia, Institute for Sustainable Futures.
- Rutter J. & Bryce J. (2006). *Understanding Digital Games*, London: Sage.
- Shove E. & Southerton D. (2000). 'Defrosting the Freezer: from novelty to convenience. A story of normalization', *Journal of Material Culture*, Vol 5, No. 3: 301-19.
- Shi A. (2003). 'The impact of population pressure on global carbon dioxide emissions, 1975-1996: evidence from pooled cross-country data' *Ecological Economics* 44(1): 29-42.
- Sorrell S. (2007). The Rebound Effect: an assessment of the evidence for economy-wide energy savings from improved energy efficiency, UK Energy Research Centre, October.
- Southerton D. (2003) 'Squeezing Time': allocating practices, co-ordinating networks and scheduling society, *Time & Society*, 12(1): 5-25.
- Staats H., Harland P. and Wilke H. (2004). 'Effecting Durable Change, a Team Approach to Improve Environmental Behaviour in the Household', *Environment & Behaviour*, 36(3): 341-67.
- Stern N. (2006). *Stern Review on the Economics of Climate Change*. Her Majesty's Treasury. Cambridge, Cambridge University Press.
- Sustainable Development Commission (2006). *I will if you will: towards sustainable consumption*.
- Tchibo GMBH (2008). 'Case Study Tchibo Privat Kaffee Rarity Machare. Documentation', PCF PilotProjekt Deutschland: Hamburg. http://www.pcf-projekt.de/files/1232962944/pcf_tchibo_coffee.pdf
- Thaler, R. & Sunstein, C. (2008) 'Nudge: Improving Decisions about Health, Wealth and Happiness', London: Penguin
- Thøgersen J. and Berit Møller B. (2008). 'Breaking car use habits: The effectiveness of a free one-month travelcard', *Transportation*, 35(3): 329-45.
- Warde A. (1999). 'Convenience food: space and timing', *British Food Journal*, 101(7): 518-27.
- Warde, A. (2009). 'Imagining British Cuisine: Representations of Culinary Identity in the Good Food Guide, 1951-2007', *Food, Culture and Society*, 12(2): 151-71
- Wiedmann T., Wood R., Lenzen M., Minx J., Guan D. and Barrett J. (2007). 'Development of an Embedded Carbon Emissions Indicator – Producing a Time Series of Input-Output Tables and Embedded Carbon Dioxide Emissions for the UK by Using a MRIO Data Optimisation System', Report to the UK Department for Environment, Food and Rural Affairs by Stockholm Environment Institute at the University of York and Centre for Integrated Sustainability Analysis at the University of Sydney. Defra, London, UK.
- Wilhite, H. (2007) 'Consumption and the Transformation of Everyday Life: A View from South India', Basingstoke: Palgrave Macmillan.
- World Business Council for Sustainable Development (2008). *Sustainable Consumption Facts and Trends from a business perspective*.
- Zhao J., Zhu N. and Wu Y. (2009). 'The analysis of energy consumption of a commercial building in Tianjin, China', *Energy Policy*, 37(6): 2092-2097.

