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Insidetrack

Resource resilient UK





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Comment

“
The greatest financial and environmental advantages are to be had from stuff kept whole and for longer.”

This edition of *Inside Track* provides some important perspectives on the concept of the circular economy. They explain, expand and inspire but, most importantly, they show the mainstream acceptance of what was once considered an impossibly radical departure from our current business models. They also put right up front the financial benefits that can follow.

Acceptance of the principles, however, is not the same as implementation on the ground. Green Alliance's work with the Circular Economy Task Force, described on page two, has shone a bright light on the barriers that stand in the way of being more circular, and has done so in a way that has already motivated businesses to try harder. That illumination now needs to give rise to enlightened and supportive public policy, the seeds of which are more visible in some parts of the UK than in others.

As the deadline approaches to produce waste prevention plans under the EU's Waste Framework Directive, and as discussions begin on expanding the scope of the EU's Ecodesign Directive, the perfect tools are at hand to make circular behaviour the norm. Even if these European initiatives weren't available, public policy has almost as powerful a reach through procurement policy and practice.

We know from the Task Force's work that everything hinges on tying together different parts of the supply chain, to generate certainty for both supply of, and demand for, recovered resources. We also know, from the work of the Ellen MacArthur Foundation and the RSA's Great Recovery Project, as well as from the Task Force, that the greatest financial and environmental advantages are to be had from stuff kept whole and for longer. Think longer product lifespans, reuse and remanufacturing, before succumbing to breaking products into their constituent materials. Public procurement can give priority to these options, and ask the supply chain for innovative solutions, in the same way that leading brands can press that case in the private sector.

The contributions in this issue of *Inside Track* show that a circular economy is possible, but those with supply chain power need to exercise that power to make it real.



Julie Hill

Green Alliance associate and chair of the Circular Economy Task Force

Making sense of a circular economy

Green Alliance convened the Circular Economy Task Force in 2012. Here, **Jonny Hazell** describes the challenges it is addressing and what it learnt in its first year

Despite being barely into its teens, the 21st century has already had a dramatic life when it comes to resources. The steady decline in commodity costs throughout the 20th century was swiftly reversed in the first decade of this century, with prices more than doubling since 2000. Of even greater concern to business has been the highest levels of price volatility since the oil crisis of the 1970s. And the assumption that the market would always provide was proved unreliable in 2010, when China rapidly cut the quantity of rare earth minerals it was willing to export, apparently as a punitive action in a fishing dispute with Japan.

In response to these trends, governments around the world are starting to focus on how to deal with export risks of key materials and crippling price spikes. The UK published its first Resource Security Action Plan in 2011, and subsequently established the Circular Economy Task Force in 2012. Convened by Green Alliance, this is a group of pioneering businesses as well as WRAP (the Waste and Resources Action Programme), with input from government departments and leading business organisations. The overarching question the Task Force is tackling is how a more circular economy could help to relieve resource supply problems.

To answer it, we first had to understand what was behind the problems. Looking at the many and various factors around the access to and volatile costs of resources, it became clear that environmental factors are a significant cause of resource risk; either because access to materials is becoming restricted due to unacceptable damage during

extraction, or because environmental conditions, such as drought or extreme weather events, are limiting production. This matters because it shifts the perspective on supply risk from the more specialist rare earths to bulk materials such as steel, aluminium, copper and polymers, which use the most energy and water to extract and refine.

Copper is a textbook example of these environmental constraints. Although there's plenty of copper left in the ground, 150 years of intense production mean deposits are sparser: average copper ore concentrations have decreased from around eight per cent in the mid-nineteenth century, to 0.6 per cent now. This means much more energy and water is used to get the copper from the ore. Given that most of the world's copper comes from Chile, mostly from the Atacama Desert, water is also a problem. Chilean copper miners are already pumping sea water 2.5km uphill and then desalinating it for use in their operations, which has contributed to doubling the cost of copper mining in the past ten years. There's a similar story to tell about oil, with the pursuit of unconventional reserves on land and deep under the sea pushing the marginal cost of production towards \$100 a barrel, up from \$25 a barrel in 2000.

If CO₂ and water prices rise, as carbon and water markets develop, costs are going to increase even more. We have calculated that, if CO₂ was to be priced according to sportswear firm Puma's environmental profit and loss accounts, the price of primary aluminium would rise by nearly 70 per cent. On top of this, some industries are suffering the



costs of the reputational risk associated with environmental damage. Financing new coal fields in Australia, for instance, now carries a 50 per cent risk premium because of public reaction. The US Dodd-Frank Act requires firms using so-called 'conflict minerals' to monitor their supply chains carefully. Whatever investors think about environmental issues, they can't ignore the dollar signs.

Environmental constraints on production are only going to get worse as supply expands to meet the demands of a rising and increasingly prosperous global population. Thankfully, keeping resources in the economy longer provides a low environmental impact alternative to meeting resource demand. In the aluminium example given above, if recycled material was used instead, the price would only rise by seven per cent. The CO₂ impact of manufacturing a mobile phone is halved if five recycled materials are substituted for virgin ones. But recycling only goes some of the way to improving the situation. By reusing and remanufacturing products it is possible to make further gains, using even less energy and water. The greatest amount of value is created through the manufacturing process: for instance, the value of a reused iPhone is about £290 but, once broken down, the value of its reclaimed materials is less than £1.

A second focus for the Circular Economy Task Force was to examine where and why businesses are already conserving resources. Our research has shown that tighter 'loops' of remanufacturing and reuse appear where products or materials are of high value, and businesses are able to retain ownership or control of their products.

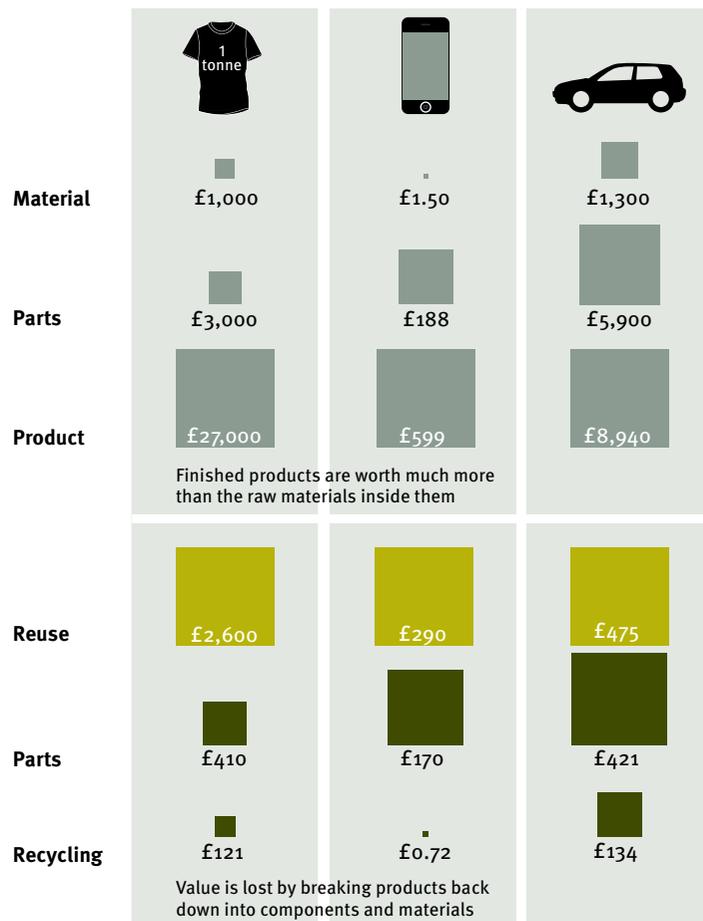
Where this control doesn't exist, companies are more likely to pursue lower value opportunities, such as basic recycling. Discarded electronics are dissected to extract gold because it has a known and flexible market. But the uncertain demand for remanufactured electronics means companies interested in providing this service struggle to raise the necessary finance. Also, because value is not recovered by manufacturers they have no incentive to adapt their product designs for better recovery.

To move to a more circular economy, intervention will be needed to tackle this trade-off between value and flexibility, and to encourage greater collaboration along the supply chain. There is a tendency to think it's government that should be taking action, but the Task Force's work over the past year has highlighted that there's much more businesses themselves can do.

Companies can act to understand their exposure to environmental risks in their supply chains. This allows them to set priorities around recapturing key resources and influencing product design. They can work with supply chains to resolve the value versus flexibility dilemma: for instance, by sharing the benefits with supply businesses through longer term contracts and protecting against volatile markets by preserving the resources within their control closer to home. They can also run their logistics systems in reverse to collect used goods and materials ready for reprocessing, as many of the supermarkets do, turning what was previously a waste disposal cost to the business into a profit from selling the materials.

It seems the main limitation to this action is scale. Only large firms with supply chain muscle can set off down this road at present. For others, public policy intervention may be the solution. One model, adopted by Japan, is to impose a responsibility on producers to recover materials. Another is to require that products are designed for disassembly or greater repairability, to provide more options for value capture.

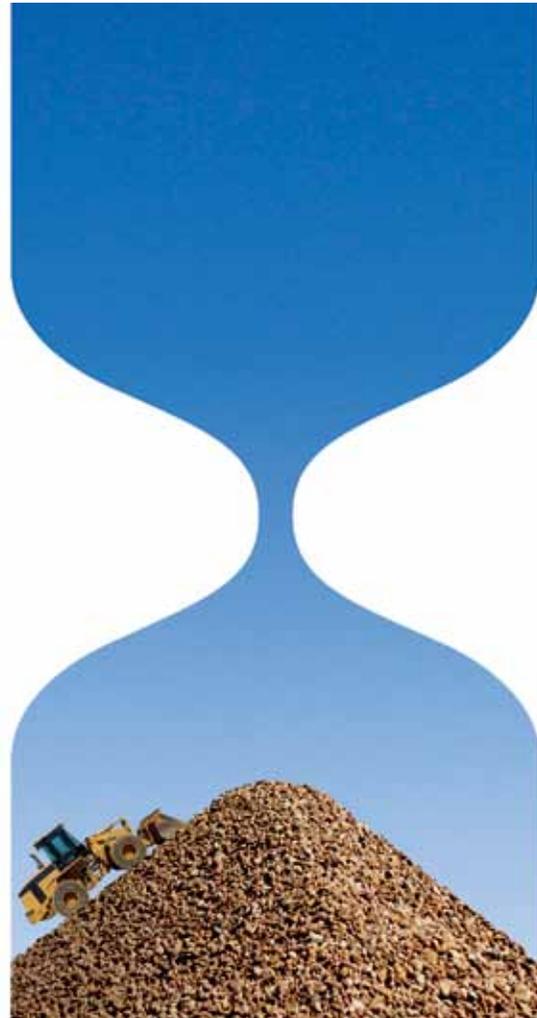
Reuse is where the money is



The Task Force's report *Resource resilient UK*, published over the summer, was the first stage in understanding how to make the economy more circular. In its second year, the Task Force will be exploring some of the questions raised in the report in greater depth. These include: what's the best scale for organising the collection and reprocessing of different materials? How resilient is the UK economy to resource supply shocks? And what should happen at the end of life of the smart new materials being developed, such as carbon fibre, metal matrix composites and nano materials? By answering these questions we can help to deliver a more resilient UK economy that makes the most of the materials we use to support our lifestyles, whilst minimising the cost to the environment.



Jonny Hazell works on the Resource Stewardship theme at Green Alliance. The members of the Circular Economy Task Force are: BASF, Boots, Interface, Kyocera, Unilever, Viridor, Veolia and WRAP



The race is on

Fraser Thompson asks if we can act fast enough to improve resource productivity

Reports of the death of the resources supercycle, which saw a sustained and rapid rise in commodity prices, have been greatly exaggerated. Although prices have fallen since their previous peaks in 2011, on average commodities now cost nearly as much as they did in 2008, before the global financial crisis hit, despite the fact that the world economy is still not back to full strength.

Not only are prices near to their all time highs, they are also increasingly closely correlated. While rapid growth in demand for resources from China has been an important driver of these increased links, at McKinsey we think there are two other important reasons.

The first is that natural resources account for a substantial share of the input costs of other commodities. For instance, energy accounts for between 15 and 30 percent of the cost of producing a crop and between 25 and 40 per cent of the cost of making steel. Future changes in prices and production processes could continue to compound these linkages. For example, more complicated drilling methods, such as the horizontal drilling used to exploit unconventional oil and gas reserves, can require four times the amount of steel as traditional vertical drilling.

Second, technology has actually enabled more substitution between resources. The most obvious example is biofuels. Higher energy prices have encouraged the use of land for energy production. This means that, while in the past there was barely any correlation between the

prices of corn and oil, since autumn 2007 there has been a very strong correlation. As the ethanol industry has become the marginal user of corn, the break even prices of ethanol production have set a floor price for corn. Another example is higher oil prices driving up the prices of synthetic products that use oil as a feedstock, such as rubber and nylon fibres, which, in turn, is putting upward pressure on natural rubber and cotton prices.

In the years ahead, resource markets will be shaped by the race between emerging market demand and the need to increase supply from places where the geology is more challenging; they will also be affected by the twin forces of supply side innovation and resource productivity.

The demand story is relatively familiar but have we really appreciated its scale? Recent doubts about the longevity of rapid growth in emerging markets need to be put into a long term context. China's economy is growing ten times as fast as the UK economy did during its Industrial Revolution and with 100 times as many people. India, too, continues its rapid development.

“The supply of energy, minerals and even agricultural raw materials is generally becoming more complex, challenging and costly.”

This means surging demand for mineral resources to finance construction booms and increasing car ownership, to name but two effects. We expect the global car fleet to double to 1.7 billion vehicles by 2030. More than 60 per cent of natural rubber is used for tyres, which goes a long way toward explaining the 350 per cent rise in the rubber price between 2000 and 2013. The growing electric vehicle market could boost demand for minerals neodymium and lithium by between 120-fold and 200-fold.

Rising incomes in these two emerging market behemoths are also fuelling demand for agricultural raw materials, as higher incomes mean more expensive food with higher nutritional requirements. In India, we expect calorie intake per person to rise by 20 percent over the next 20 years, and China's per capita meat consumption could increase by 40 per cent, which would still be well below US levels.

With the exception of the shale gas revolution in the US, the supply of energy, minerals and even agricultural raw materials is generally becoming more complex, challenging and costly. This means that supply appears to be progressively less able to adjust rapidly to demand. Increasingly, reserves of natural resources are found in difficult places: deep underground and deep underwater for instance. Twenty four per cent of offshore oil wells are now in deep water, compared with 19 per cent in 2005. The richest untapped mineral reserves are mostly in frontier economies that have little infrastructure and are often not politically stable. Almost half of new copper projects are in countries with a high degree of political risk.

The supply of arable land is increasingly under strain, too. Urbanisation, a global phenomenon, could encroach on an estimated two million hectares of land a year, about three quarters of which is agricultural land. That means the land left to cultivate tends to be further

from markets and on poorer soil. These developments are only exacerbated by the impact of extreme weather events.

McKinsey has estimated that more than one fifth of the world's arable land is seriously degraded from pollution, soil nutrient mining and salinisation. Different studies offer a wide range of estimates for the impact of climate change on agricultural yields, but we take a conservative estimate that yields could be two per cent lower as a result by 2030.

“The means are available to create a resource productivity revolution on a similar scale to the transformational changes in capital and labour productivity witnessed during the 20th century.”

Technology has ridden to the rescue before and the shale gas revolution shows it can in the modern era, too. There is no shortage of resource technology, and higher resource prices are likely to be a catalyst for faster innovation. Technology could transform access to both resources and productivity. For example, 3D and 4D seismic technology could significantly improve energy exploration, while organic chemistry and genetic engineering could foster the next green revolution.

The means are available to create a resource productivity revolution on a similar scale to the transformational changes in capital and labour productivity witnessed during the 20th century. Previous McKinsey Global Institute research has identified resource productivity opportunities worth over \$3 trillion, which could reduce demand for land, minerals, water, and energy by over 20 per cent in 2030. Just 15 types of opportunity, from improving the energy efficiency of buildings to moving to more efficient irrigation, could deliver about three quarters of the prize.

However, capturing such resource productivity opportunities will not be easy. Only about a third of the opportunities are readily accessible; many others face barriers including large capital requirements, principal agent issues, and information failures.

The key question is whether policy makers and businesses can implement measures fast enough to achieve a soft landing of stable or gradually declining resource prices and reduced environmental risk. If they are too slow to seize the opportunities and the world experiences a hard landing, characterised by a period of very high and volatile resource prices, this would place even greater pressure on the world economy at a time when it is facing strong headwinds. The race is on.



Fraser Thompson is senior fellow at the McKinsey Global Institute



The next manufacturing revolution?

There are substantial value creation opportunities for businesses developing circular resource flows, says **Dr Doroteya Vladimirova**, which can put them way ahead of the competition

Increasing competition for resources, volatility of commodity prices, and a changing climate mean manufacturing firms will do business differently in the future. In the past, manufacturers sought competitiveness by squeezing down labour costs. Labour productivity improvements have reduced labour costs since 2001 by three per cent a year. These costs now stand at £75 billion in the UK. But non-labour costs are four times greater than the labour costs which receive so much management attention, and they've been rising at 0.4 per cent a year since 2004, adjusted for inflation and production volumes.

Leading companies show us that non-labour resource costs are not fixed and deserve to be a focus for management attention. Work undertaken by the Next Manufacturing Revolution (NMR) shows that opportunities for non-labour resource productivity could increase manufacturing profits by 12 per cent, increase manufacturing employment by 314,000 jobs, and cut 4.5 per cent off the UK's total greenhouse gas emissions. None of this comes at a cost to consumers in terms of increased product price or reduced product function.

Acting early to capture these opportunities will bring competitive benefits to companies, provided the opportunities are created by a long term structural change in the industry, ie a true revolution. This type of manufacturing revolution would also bring additional benefits such as improved energy and food security, less pollution and traffic congestion, reduced investment and maintenance spending on energy

and transportation infrastructure, and economic development in developing countries that supply UK manufacturers.

The NMR is a not-for-profit initiative founded in 2012 by strategy advisors Lavery/Pennell, business community experts 2degrees and the Institute for Manufacturing at the University of Cambridge. Its report *Non-labour resource productivity and its potential for UK manufacturing* is based on input from global experts, multinational corporations, an extensive literature review and a small sample survey of manufacturers, making it one of the most comprehensive analyses of resource management in UK manufacturing to date. Changes the NMR programme advocates involve proven technologies and have already been implemented by pioneering companies; in many cases actions are straightforward and deliver quick returns.

Specifically, seven areas of substantial value creation opportunity have been identified for the manufacturing sector. These are supply chain collaboration to address resource efficiency; energy efficiency; process waste reduction; packaging optimisation; transport efficiency; revenue growth from resource productivity; and circular resource use.

All offer greater profits while lowering a manufacturer's environmental footprint and can, either directly or through improving the cost base of UK manufacturing, safeguard and grow employment in this sector. Here, we focus on the seventh area: circular resource flows.

Circular resource flows are one of the critical areas of substantial

value creation opportunity in the manufacturing sector identified in NMR's report. Also called 'closed loop', it enables society to capture further value from products beyond their initial usage. The cross sectoral opportunities identified by the NMR programme are outlined below:

Sub sector	Reuse	Remanufacturing	Cascaded use	Recycling	Recovery
Food, beverage and tobacco					✓
Textiles, wearing apparel and leather products	✓	✓	✓	✓	✓
Wood, paper products and printing	✓	✓	✓	✓	✓
Chemicals and chemical products		✓	✓	✓	
Rubber, plastic and other non-metallic mineral products		✓	✓	✓	✓
Basic metals and metal products			✓	✓	
Electrical, electronic and optical products	✓	✓	✓	✓	
Machinery and equipment n.e.c.	✓	✓	✓	✓	
Transport equipment	✓	✓	✓	✓	
Other manufacturing and repair				✓	✓

In most instances, higher value and greater environmental benefits can be captured from reuse and remanufacturing.

While recycling rates are high in the UK, there is minimal activity in higher value circular resource flows, for example, remanufacturing accounts for just one per cent of UK manufacturing sector turnover. This is despite global pioneers in remanufacturing being able to capture 95 per cent of accessible products and using them to generate substantial additional profits. Xerox, for example, recaptures 95 per cent of equipment sold through direct channels, and Caterpillar successfully captures 95 per cent of eligible end of life returns.

A number of leading companies have moved beyond recycling to access greater value. They succeed by retaining control of their products, managing their products while in use, resolving reverse logistics challenges, building remanufacturing capabilities and designing for longevity and circular resource use. The manufacturing sub-sectors that offer the greatest opportunities to capture significant value from circular resource use are: electrical, electronic and optical products; machinery and equipment; and transport equipment. For just three sub-sectors, remanufacturing could create £5.6 billion to £8 billion a year of value.

Circular resource flows have a number of non-monetary benefits. Reduced use of virgin resources means greater availability for future generations, and less environmental damage and pollution from their extraction, processing and transport. These environmental benefits mostly occur overseas. In the UK, greater recycling, reuse and remanufacturing means fewer landfill sites and incineration facilities. Having fewer manufacturing steps also generates environmental benefits from reduced

greenhouse gas emissions, as well as other pollutants generated in the processing of raw materials into parts.

To achieve the financial and non-monetary benefits of circular resource flows, however, manufacturers have to overcome a number of barriers. Changing the perceptions of an entire organisation and its customers is a difficult task requiring the skills, experience and influence of senior executives. Information issues exist, such as awareness of potential untapped profits and lack of understanding of terminology, such as 'remanufacturing'. The skills required to develop circular resource flows include strategic thinking, engineering, marketing, logistics, process design and change management. In addition, product design plays a crucial role in the success of remanufacturing because it directly impacts on the ability of a company to monitor, disassemble, inspect and reassemble remanufactured products. In addition, a recovery infrastructure is required. Legal constraints that primarily consist of legal impediments and access to product information have to be overcome. Collaboration and, especially, customer acceptance of circular products are essential for the adoption of circular resource flows.

“
While UK manufacturers are generally familiar with non-labour resource productivity topics, they have rarely pursued them to their full potential.”

When revolutions occur, the economic benefits to those companies and countries at the forefront of the change are disproportionate: profits increase and new industry leaders emerge with strong competitive positions that can last for decades; host countries' jobs, economies and exports all benefit. While UK manufacturers are generally familiar with non-labour resource productivity topics, they have rarely pursued them to their full potential.

In part, we believe that this is because non-labour resource productivity has been too poorly quantified and aggregated to secure the senior management attention, resources and expertise that it warrants, but also because there are a range of barriers to adoption. Addressing these resource efficiency topics together, therefore, builds a more compelling case for change and can create a coherent roadmap to increased business profitability.



Dr Doroteya Vladimirova is lead researcher at the EPSRC Centre for Industrial Sustainability, Institute for Manufacturing, University of Cambridge

Rising to the circular economy challenge

Defra minister **Dan Rogerson** describes the economic and business opportunities his department sees in supporting a circular economy in the UK

The Circular Economy Task Force's report, *Resource resilient UK*, provides a robust business-led view of how the UK can achieve a more resource efficient future and benefit from the subsequent opportunities to improve resilience and competitiveness, both for individual businesses and the wider economy.

Boosting sustainable growth whilst continuing to protect and improve our environment is a strategic aim for Defra. A key part of this agenda is encouraging and giving businesses the opportunity to become more sustainable. There is scope for innovation, sustainable growth, saving money and reducing environmental impacts. 'Closing the loop' to manage waste effectively can also provide new ways of using precious materials to help reduce the risk of exposure to volatile and high commodity prices.

Making the changes needed may be challenging, but is important because of the benefits it brings. Businesses managing resources more efficiently can create more with less. Disposal to landfill should be seen as the last resort. Overall, our vision is for the UK to have a thriving, growing resource management industry with innovative businesses rising to the challenge.

The vast majority of what is produced should be reused or recycled, because it has been designed and created with this in mind. Businesses, local councils and waste companies can all help by making it easier to reuse and recycle products.

The scope of the Task Force's report is particularly welcome, looking not just at the potential role for government, but also at the role of investors and businesses to act. This is one of its most important messages.

We live in times of dramatically constrained financial resources. The government's role must be to set the conditions and guidelines to allow the market, businesses, local authorities and individuals to make



changes that will propel us towards a more circular and sustainable economy.

Resource resilient UK picks up on the opportunities for collaboration presented by the government's approach to the Industrial Strategy. Over the past year we have worked in partnership with business to develop long term strategies for key sectors including construction, automotive, aerospace and agricultural technologies. They have allowed us to explore the challenges and, together, set out plans to build their capability and align government activity to give business confidence to invest, grow and address genuine market failures. We will continue to use and develop these partnerships and explore some of the thinking outlined by the Circular Economy Task Force.

It is important that the right frameworks are in place to allow businesses to act and Defra has just published its first Waste Prevention Programme for England, which will go some way to addressing this.

Businesses need to consider waste at all stages of a product's lifecycle and how they can help to reduce it. There are many approaches that can help. These include: improved design to increase the retention or regeneration of materials and components within the economy; extending the lifespan of products by allowing more repair and reuse, and the use of different business models incorporating take-back schemes, leasing and producer responsibility.

WRAP and the Technology Strategy Board (TSB) are supporting these innovative approaches. The recent TSB competition 'Design challenges for a circular economy' will invest up to £1.5 million in collaborative research and development to encourage companies to rethink the design of products and how they can reduce their environmental impact.

The Task Force also identified opportunities for taking forward the circular economy concept in the EU's Ecodesign Directive. This aims to reduce the environmental impacts of products, including energy consumption, throughout their entire lifecycle. To date, the directive's process for energy related products has successfully secured improvements to energy efficiency and consumption. By 2020, it is estimated that agreed ecodesign and labelling measures will be benefiting the UK economy by around £1 billion a year and will avoid five million tonnes of greenhouse gases. The next stage of measures will generate around a further £0.5 billion and save six million tonnes of greenhouse gas annually.

“**Businesses managing resources more efficiently can create more with less. Disposal to landfill should be seen as the last resort.**”

The UK is continuing to encourage the European Commission to include waste and materials issues in its legislation. Periodic review of each of the product specific regulations offers an opportunity to address this, particularly for products where there is limited potential to benefit from further energy efficiency.

We also want to work with businesses and NGOs to develop further evidence for change and to find new ways to break down barriers to progress. This can be done through practical research. A good example is a project called REBUS which is testing a new way of providing

pushchairs. The approach explores the potential of a business model where the consumer purchases the use of a product, rather than the product itself. In this case, the consumer rents a pushchair which can be exchanged, reconfigured or upgraded as their child grows. The used models are then refurbished for someone else to use.

“**The recent TSB competition 'Design challenges for a circular economy' will invest up to £1.5 million in collaborative research and development to encourage companies to rethink the design of products and how they can reduce their environmental impact.**”

From the consumer's perspective, this offers a much more flexible, affordable and possibly higher quality service. For business, there are potentially new routes to market, greater revenue from the product and increased brand loyalty. Alongside this is the incentive for businesses to redesign their product to satisfy those aims, making it more robust, easier to refit and longer lasting.

This type of evidence building approach is something we want to encourage further. We are pleased to have announced a call for a new round of practical research projects. These will look at how to incentivise action throughout the supply chain, including supporting SMEs to be more innovative, improve their sustainability and reduce their waste.

There is great potential for the UK to shift towards a more circular economy and, at Defra, we will provide support where it is appropriate. Everyone, including government, industry and consumers, has a stake and a part to play in making this happen. It is a question of looking for and grasping the opportunities, and providing the conditions to allow the market, businesses and individuals to rise to the challenge.



Dan Rogerson MP is parliamentary under secretary of state for resource management at the Department for Environment, Food and Rural Affairs



First steps toward closed loop supply chains

Adrian Cole and **Simon Drury** describe how sustainability consultancy Ricardo-AEA is working with companies on the change towards closed loop systems

Strategies used for managing waste or, as we are now beginning to consider it, ‘end of first life materials’, can make the difference between it being a cost or a revenue stream to UK businesses. Businesses are being told “to do more with less” and increase resource efficiency, by government, customers and staff; but this need not cost companies, it may actually empower change that results in positive returns for investors and customers alike.

It is clear that recycling is now the business norm, which is not something we might have predicted only five years ago, and the vast majority of organisations are recycling many materials. With new requirements, such as the new Scottish Waste Regulations, stipulating source segregation of recyclables from households and businesses,

this momentum will inevitably continue to build over the next two or three years.

Many businesses report achieving zero waste to landfill for the majority of their targeted waste streams and have made this a central plank of their sustainability strategy. But, in a world that is likely to become more dominated by increasing resource scarcity and where the costs of the raw materials are increasing, so, unexpectedly, is the value of our waste materials. So, is zero waste to landfill really the right objective for UK businesses to aim for?

The Ellen McArthur Foundation highlighted in *Towards the circular economy* that a move to a circular economy in the UK could contribute nearly £1 billion a year from avoided food waste to landfill alone. Green

Alliance's Circular Economy Task Force report *Resource resilient UK* shows how co-operation between players, and through supply chains, can help enable the switch to a more circular approach to resource management, and thus, by default, waste management.

“Relationships that involve tough negotiations on price can be hard to extend to more collaborative engagements.”

At Ricardo-AEA we have been creating supply chain partnerships for a number of years. Initially starting under the former Envirowise programme with the aim of finding discrete, quick win opportunities for waste minimisation actions. More recent activity with WRAP has enabled us to focus far more on sustainable procurement of specific resources or products and bring in circular economy logic and thinking.

Irrespective of the drivers, many companies can be daunted by the barriers and apparent complexities when trying to change their supply chain. Good communication is important and, wherever a company lies within the supply chain, there are a number of basic questions to ask, depending on the particular sector and its products and services. These include whether they understand their customer's standard operating procedures and practices, where the value for the customer lies and how customers use the product or service.

We have worked with a wide range of sectors and supply chains, from hospitality and leisure to food manufacturing. Amongst the companies we work with, we have seen many examples of resource efficiency gains, resulting in immediate benefits to companies. Recent examples include:

- cleaning and diverting plastic waste from landfill created an income potential of £49,000 a year, while keeping non-renewable resources in productive use within the business;
- reusable packaging saved £94,000 a year in purchasing and disposal costs (after initial payback for the returnable packaging system) and eliminated future wasted resources;
- segregating food waste, by diverting from landfill to anaerobic digestion, delivered a reduction in waste costs for the business of £15,000 a year and retained valuable biological nutrients;
- incentivising customers to adopt monthly deliveries using pallets reduced transport costs by £4,000 a year and increased sales by a further £6,000 a year, avoiding damaged goods and their disposal costs; and
- standardising carton sizes enabled easier reuse and reduced packaging waste by £2,000 a year.

We have been greatly encouraged by the ways in which many businesses are responding to the resource challenge. For example, the distribution company 3663 are working with us in a WRAP supported partnership. Perhaps not surprisingly, given 3663's involvement in many supply chains in the food service sector, they have already been involved with supply chain improvements. Despite this experience, they did not find it straightforward when they tried to engage their supply chain on energy efficiency.

Relationships that involve tough negotiations on price can be hard

to extend to more collaborative engagements. This problem can be overcome by involving a neutral broker, such as WRAP, to promote the information sharing necessary to find opportunities for savings.

Some of these opportunities are substantial: 3663 have successfully established a closed loop system for cooking oil. Working with their customers and technology partner Convert2Green, they have saved over 20,000 tonnes of carbon to date, using reprocessed cooking oil to fuel their delivery fleet.

Perhaps the most important lesson we have learnt from our work is the critical role that people play within organisations. Good data and systems are important but success depends on changing behaviour, and this is all about effective communication and creating understanding and ownership for the new approach or solution.

There is a danger that the new circular economy theory and terminology could seem academic, leaving out the most important instruments for change: people. No one understands the inefficiencies in a manufacturing operation or service better than the people on the shop floor. When people are aware of and understand the need for change, it is human nature to want to be part of the solution. Sometimes it's just a case of asking the right questions and looking at established practices from a fresh perspective. But it needs to be encouraged with staff as it may not be the norm and change can be difficult to accept.

“No one understands the inefficiencies in a manufacturing operation or service better than the people on the shop floor.”

Whether driven by the need for cost savings or to meet a customer's expectations, it is not enough any longer for a business to just recycle or to say it has achieved, or is working toward, zero waste to landfill. The key objective must be to reduce materials consumption, driving the management of materials as high up the resource hierarchy as possible and optimising revenue from materials. This will ensure a sustainable, profitable and viable business in the longer term.



Adrian Cole is Ricardo-AEA's business manager for closed loop projects, **Simon Drury** is Ricardo-AEA's knowledge leader for resource efficiency

What will it take to design a circular ec

Three members of the Circular Econom

share their experiences

Brokering better resource use

Louis Lindenberg highlights the importance Unilever places on bringing consumers and fellow businesses with them on the road to better resource use

At Unilever we are all too aware that rising and volatile raw material prices are here to stay, driven by growing demand and increasing environmental constraints on production, not to mention concerns over where the future supply of several natural resources will come from. The waste section of our Sustainable Living Plan focuses on minimising the quantity and the environmental impact of the resources we use, with circular resource use being a key part of this. We've found we can't meet our targets on our own: to deliver our Sustainable Living Plan we need to bring both business partners and consumers with us.

We've set ourselves the goal of halving the waste associated with the disposal of our products by 2020. This means redesigning our packaging to reduce material usage and using materials that best suit local recycling systems; increasing the recycling and recovery rates of packaging materials; and increasing the use of recycled materials. Of these, only packaging design and choice of materials is completely within our control. Increasing recycling and the use of recycled materials require system changes that involve government, environmental companies, local authorities, reprocessors and, of course, our consumers. That's why we're engaging these groups to work together in reducing Unilever's environmental impact.

An excellent example of how we are engaging with our supply chain is the forum we have joined in the UK, which aims to increase the collection and recycling of all plastic grades and formats. We are particularly engaged in stimulating increased collection and recycling of polypropylene (PP) pots, trays and tubs. PP is a wonderfully versatile material, which means it's used in a great variety of applications. Unfortunately, this variety means that post consumer PP contains mixed grades affecting the quality of the recyclate and, thus, limiting potential high value applications. We would like to use as much recycled content in our packaging as possible; however good quality material and consistent supply remain a challenge for some types of plastic. Recycled

PET, the plastic used in water bottles amongst others, is readily available at a high quality, whereas recycled PP is virtually non-existent. Currently, there is only a limited incentive to invest in better recycling systems which capture and reprocess more polymer formats. To break this cycle, we are participating alongside other supply chain actors, from each stage of the recycling process, in an attempt to bring about change through collaboration.

Developing infrastructure and collecting more types of material has to be connected to habit change. Consumer actions determine whether a piece of packaging is collected for a second life or disappears into landfill. We're looking into what we can do to help people waste less and recycle more, and have teamed up with various partners to improve consumer education. An example of this is our participation in the UK MetalMatters and Plastic Please programmes, focused on educating consumers about materials which can be recycled by their local authority. Only by working with our consumers and our fellow businesses can we change systems to minimise the quantity of valuable materials ending up in landfill.



Louis Lindenberg is global packaging sustainability director at Unilever

onomy? y Task Force

Pushing the boundaries

Ramon Arratia outlines four lessons Interface has learned about becoming a more circular business

As more companies struggle with the spiralling cost of resources, the circular economy will help businesses tackle resource insecurity. At Interface, we started our journey towards a circular economy many years ago and today 49 per cent of our global raw materials are recycled or bio-based. However, the route to creating a circular economy is not easy and, as Green Alliance points out in *Resource resilient UK*, “No single intervention on its own will be sufficient”. Here are four lessons we’ve learned from our work to become a circular business.

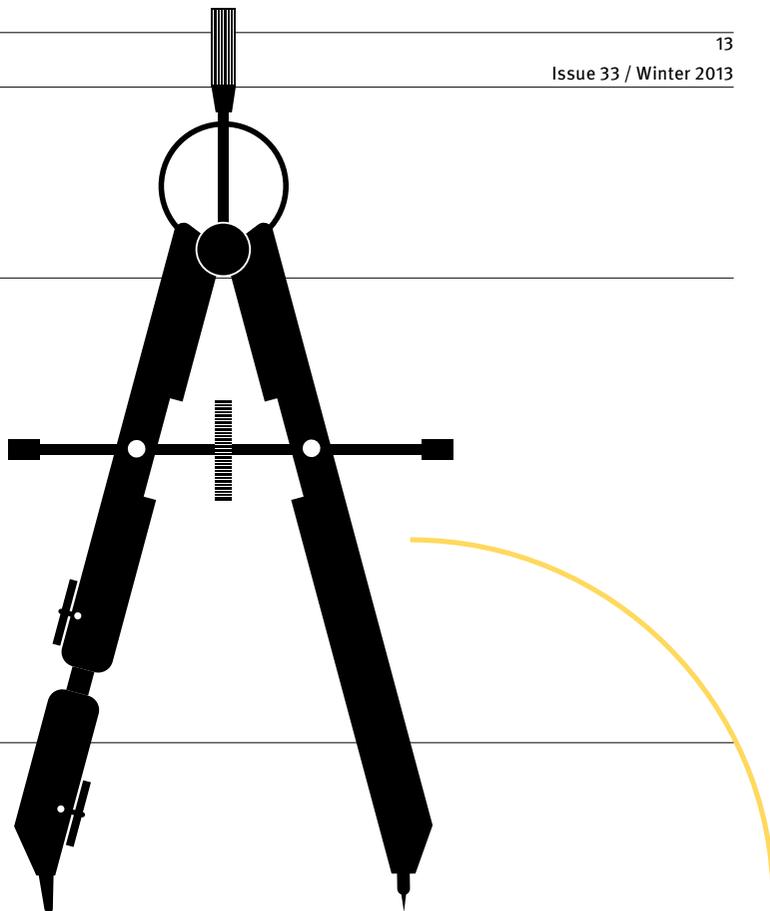
1. The circular economy is modular

Companies need to completely rethink the way they design their products, so that end of life responsibility is considered and ‘designed in’ at a product’s conception. To achieve this, products need to work in a modular way, where different components can be separated and easily replaced. For example, in a typical building it would be far easier to maintain and replace parts if every element was designed to be modular.

2. One man’s waste is another man’s treasure

Companies should look for opportunities to scavenge waste from other industries. For example, we have been working with the Zoological Society of London on a unique partnership called Net-Works, building a new source of recycled material for our carpet tiles from fishing nets discarded on beaches or in the sea. Net-Works has established a community-based supply chain for collecting the waste nets in rural coastal villages within the Danajon Bank, one of only six double-barrier reefs in the world.

As a result of this inclusive business partnership, communities get the best possible price for the nets, are encouraged to clean up coasts and waters, and are included in global supply chains, an opportunity that would otherwise not be available to them.



3. Make them an offer they can’t refuse

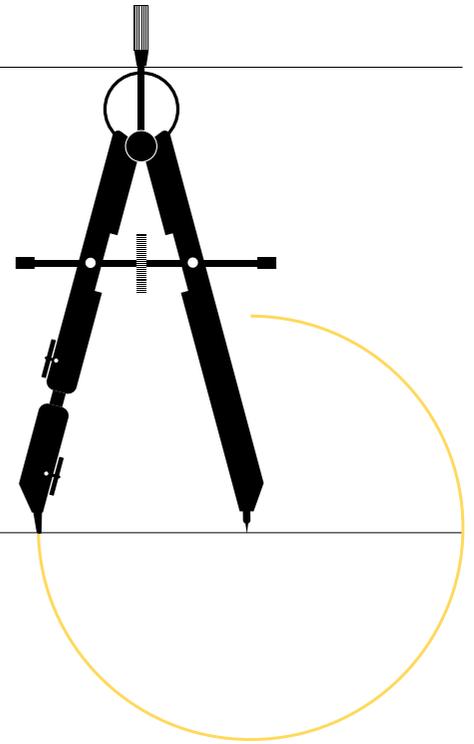
Getting your supply chain to work with you can take a bit of encouragement. When we wanted to develop a product made from recycled nylon, we found we weren’t a big enough nylon buyer to interest nylon producers. But we are a big buyer of yarn: it’s the main component of our carpets. So we told our yarn suppliers that we wanted recycled nylon yarn, and one, Aquafil, saw that it was worth their while to work with us. Identifying which parts of our supply chain we could influence most was key to bringing recycled nylon flooring to the market.

4. A sustainable future relies on disruptive innovation

According to the World Economic Forum, at least US\$2 trillion of economic output could be protected in 2030 if the world adapts more rapidly to an increasingly resource constrained economy. We’ve had to disrupt the raw materials and manufacturing processes in our supply chain to start to adapt. Pushing the boundaries of design, manufacturing, and supply chains isn’t easy but there’s a big prize for those who succeed.



Ramon Arratia is European sustainability director at the global carpet tile manufacturer, Interface



Collaborating for change

Peter Maddox and **Patrick Mahon** explain how WRAP is supporting collaboration between sectors on resource use, with impressive results

For more than a decade WRAP has been successfully helping business, the public sector and consumers to reduce waste and increase resource efficiency. Over that time, the debate in the UK has largely moved away from how to dispose of waste safely to how to get more value out of resources. The focus is now much more on holistic and circular approaches to a product's entire lifecycle.

WRAP's strategy has evolved along with this shift. As the Circular Economy Task Force has demonstrated, collaboration is important to developing circular systems. Where previously we may have worked with individual companies to find new ways to recycle wastes, now we spend much more time working with business sectors, helping all the actors collaborate to create a more resource efficient outcome.

One way we are doing this is via the Courtauld Commitment. This voluntary agreement aims to reduce food and packaging waste in the UK grocery sector. It spans the entire supply chain, from retailers and brand owners to manufacturers, suppliers and consumers. The agreement is now in its third phase, which runs to 2015. In meeting its phase three targets, the Courtauld Commitment will have helped to deliver a 20 per cent reduction in household food waste over the ten years since its inception.

Another example is the Sustainable Clothing Action Plan (SCAP). By bringing together industry, government and the third sector, WRAP is working to improve the sustainability of clothing across the entire lifecycle. This work focuses not just on waste, but on global carbon and water impacts too.

A key reason for the success of the Courtauld Commitment, SCAP and other voluntary agreements is WRAP's involvement in brokering the process of collaboration, whether between competitor businesses or across an entire supply chain. We help by convening and structuring discussions on shared goals and overall directions, as well as providing unbiased evidence on which to base decisions. This helps businesses to put aside competition and commercial sensitivities, and can pave

the way to the adoption of voluntary agreements.

In our experience, these agreements are a powerful way of pulling together the major players in a sector, encouraging them to commit to and drive action. By collectively developing a clear strategic framework for change and setting targets, such agreements give clear, consistent signals to a sector's suppliers on its priorities and level of ambition. WRAP then provides further support by helping signatories to act, drawing on sector-leading expertise and groundbreaking research to make happen.

“**Collaboration helps companies go further than they would or could do individually.**”

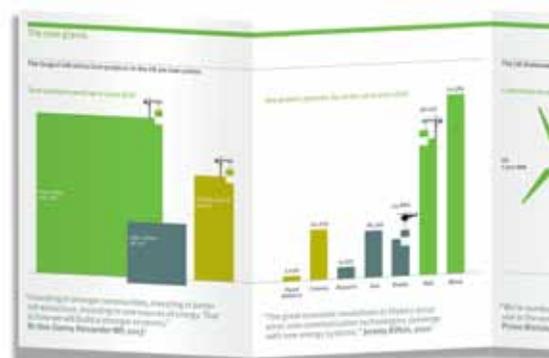
Collaboration helps companies go further than they would or could do individually. It helps spread understanding of what's required and what works, and makes the achievement of tipping points in the scale of activity more likely. We are pleased to be a member of the Circular Economy Task Force, promoting and putting collaboration into practice, which was a key recommendation of its first year report.



Peter Maddox is head of strategy and planning and **Patrick Mahon** is government affairs analyst at WRAP.

Low carbon infrastructure: better for the short and the long term

Julian Morgan's recent analysis has demonstrated the opportunity low carbon infrastructure offers to boost the economy



If Britain is to successfully decarbonise it will have to renew its energy and transport infrastructure. Electricity needs to be generated in a way which does not involve releasing carbon dioxide through the burning of fossil fuels. Transport needs to move away from its reliance on the internal combustion engine.

While this is a tremendous challenge, it is perhaps less well appreciated that it also creates an economic opportunity. Economists have long been calling for a recovery which is sustainably based on investment rather than consumer spending financed by borrowing. The question is, what contribution to this economic renewal can investment in low carbon infrastructure make?

This was the challenge I was given when I joined Green Alliance in April. My first task was to lead an analysis of the current plans as set out in the Treasury's infrastructure pipeline.

The first finding from this analysis turned up some good news, that 71 per cent of planned spending was made up of low carbon investment, and that renewable energy and public transport projects predominate. If these plans were implemented, spending on low carbon infrastructure would increase significantly over the next two years. In the current economic climate, the increase in low carbon infrastructure spending would also provide a useful and timely boost to economic growth.

But, despite these promising plans, there were already worrying signs that new orders for infrastructure projects were slowing as investor confidence appeared to have been dented by policy uncertainty. At the time, we called for clearer and more consistent messages to investors from

politicians to reduce the risk that these projects are not delivered as planned.

To complement this economic analysis, we produced an infographic highlighting the key features of the UK's low carbon infrastructure, including both large and small scale projects. This showed that the UK is ahead in the global trend to make new infrastructure low carbon and we are



already a world leader in offshore wind. Alongside these large scale projects, major change is also occurring through a multitude of small scale projects and activities, modernising and improving the UK's underlying energy infrastructure

This work provided the backdrop for our summer reception in July, at which Shadow Chancellor Ed Balls and Martin Wolf, the chief economics commentator at the *Financial Times*, discussed the future of UK infrastructure. Over 200 representatives from charity, business and government

joined us for the debate. In his speech Ed Balls announced that Labour would set a 2030 decarbonisation target for the UK and give the Green Investment Bank more borrowing power.

A new version of the Treasury's Infrastructure Pipeline, released in December, appears to reflect our fears about the delivery risk of some low carbon investment. Although the majority of the pipeline remains low carbon, there has been a dramatic decline in spending in this area up to 2015. In particular, spending on offshore wind projects over the period 2012-13 to 2014-15 has fallen from £20 billion to just £3 billion. This is a missed opportunity, both in terms of slowing the speed of transition to a low carbon economy, and because of the short term economic stimulus such investments can provide.

Through this work we have highlighted that investment in infrastructure which supports a low carbon, resource efficient economic transition can also be a cornerstone of a new growth model. It has the potential to be economically, as well as environmentally, sustainable. It can provide a short term stimulus, contributing to a rebalanced economy, towards investment and away from debt financed consumption, and support longer term growth.



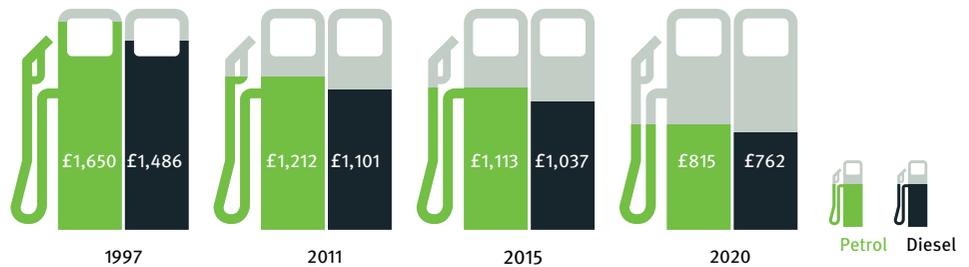
Julian Morgan is chief economist at Green Alliance

Why we need the EU for climate and energy policy

Negotiations on the future of European climate and energy policy this winter will, arguably, have a more significant influence on the future of the energy sector in the UK than anything else in the next decade, says **Rachel Cary**

Annual fuel cost per new car to drive 15,000km

CO₂ standards for new vehicles have significantly reduced fuel costs, and will reduce them further in future.



From *What has EU climate and energy policy done for the UK?* (October, 2013)

Whilst some in government are questioning whether we should be in Europe at all, it will be vital that David Cameron plays an active role in the negotiations for the 2030 climate and energy package. It will be important not to step back if we are to secure benefits for the UK and maintain Europe's leading role on climate.

In 2009, the European Commission put in place a framework for 2020 that would have a massive impact on energy supply across Europe. The groundbreaking '20:20:20 package', as it has been known, set mandatory targets for greenhouse gas reductions and renewable energy across Europe and a non-binding target for energy efficiency. Now the Commission has just five months to agree a new framework for 2030 ahead of the European Parliament elections. If it doesn't manage to agree a headline greenhouse gas reduction target, the backbone of the package, there is a risk of entering into important international climate negotiations without a common EU position. This would not only be embarrassing but would also jeopardise the EU's established leadership position.

The UK has set out its stall early, signalling support for a fairly ambitious greenhouse gas reduction target of 40 per

cent, moving up to 50 per cent target with a comprehensive global agreement; but it doesn't want to commit further, for instance to a renewable energy target.

Before moving forward to develop new policy it is important to take stock of what has been achieved so far, and what hasn't gone so well. So, over the summer we interviewed 20 experts from business, NGOs and academia to ask their opinions about what past climate and energy policy has done for the UK.

Despite criticism of some individual policies, there was a surprisingly high degree of consensus. The experts we consulted agreed that Europe has been good for climate and energy policy in the UK and that we should remain an active player in Europe and not retrench.

Doing energy and climate policy at a European level makes sense: it reduces costs for businesses, which are more able to deal with common and consistent regulatory frameworks; and business likes large markets, as it can capitalise on the economies of scale.

European policy has also helped to clean up the air by regulating vehicles and power stations and has saved consumers money by ensuring appliances and cars are more efficient.

Not everything in the 2020 package was

a success. Green Alliance's recent slide presentation on the options for the 2030 package reflects on some of the issues with existing policy and considers the pros and cons of the potential elements of a new package.

It is vital that the prime minister leaves the 2030 negotiations with a greenhouse gas reduction target of 50 per cent, if Europe is to meet its long term carbon targets and remain a global leader on climate. But other policies to support this are also necessary. For example, there must be greater clarity within the power sector, through regulation or binding targets for renewables, if we are to have any chance of delivering a carbon free electricity sector; this is crucial to delivering the top target. Getting this package right for 2030 will involve delicate and difficult negotiations, but it will be worth the fight.



Rachel Cary is head of energy at Green Alliance

Recent events



First Green Alliance Leadership Lecture

The Deputy Prime Minister Nick Clegg delivered the first Green Alliance Leadership Lecture at the RSA in London, on 7 November, setting out the Liberal Democrats' approach to the natural environment, energy bills and the green economy.

EU climate and energy policy for 2030

At the end of October we invited the EU environment commissioner Connie Hedegaard to discuss the business case for strong European climate and energy policy with the CBI and a range of companies and energy experts.

Can fracking be sustainable?



Our annual debate this year was chaired by *The Guardian* commentator Zoe Williams. The panellists were Green MP Caroline Lucas, Michael Liebreich of Bloomberg New Energy Finance, Lord Chris

Smith of the Environment Agency and David Kennedy of the Committee on Climate Change. They debated a range of issues, from fracking's local impacts, to the role of shale gas as a transition fuel and its likely influence on future economic and energy policy.

Find out more about what was discussed at these events, and at our summer reception (see page 15), at storify.com/GreenAllianceUK

New trustee



Earlier this year we welcomed **Dr Alan Knight** to our board. He brings expertise from nearly 20 years' experience of working on sustainability,

with governments, global and national businesses. He is sustainability director at Business in the Community, one of The Prince's Charities. Alan chairs the UK Task Force on Sustainable Growing Media; he is a founder of the Global Association of Corporate Sustainability Officers and teaches at Cambridge, Plymouth and Exeter Universities.

New individual members

Welcome to:

Rupert Callingham

Thea Cassell

Joshua Eldridge

Louise Ellaway

Stephen Gee

Julian Jackson

Chantal Lyons

John Midgley

Elena Perez

Cheryl Pilbeam

Sylvia Rowley

Godfrey Spickernell

Clym Tomas Stephenson

Shuet Kwan Tang

Sophie Thompson

Marc Tschirley

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Green Alliance is a charity and independent think tank focused on ambitious leadership for the environment. We have a track record of over 30 years, working with the most influential leaders from the NGO, business, and political communities. Our work generates new thinking and dialogue, and has increased political action and support for environmental solutions in the UK.

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