delivering resource productivity: the service solution

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Delivering Resource Productivity: the Service Solution

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Green Alliance

Green Alliance is one of the UK's foremost environmental groups. An independent charity, its mission is to promote sustainable development by ensuring that the environment is at the heart of decision-making. It works with senior people in government, parliament, business and the environmental movement to encourage new ideas, dialogue and constructive solutions.

contents

"By looking at the whole system and focussing on fulfilling the consumers' needs, this business model rewards for doing more with less, improving customer value and the bottom line. Higher profits will come from providing better solutions rather than selling more equipment."
Rt Hon Patricia Hewitt Secretary of State for Trade and Industry[1]

"The BBC is increasingly using the service partnership business model to achieve efficiencies and best-in-class management of key services. Our key partnership with Land Securities Trillium has brought investment, innovation and optimisation in a range of services including waste recycling, energy-use, building services, catering etc. Not least, this partnership has allowed the BBC to upgrade inefficient and out-of-date offices and studios by developing some impressive and sustainable new media buildings - including the new Media and Broadcast Centres at White City (both of these buildings achieved 'Excellent' BREEAM ratings at design and post-completion)."
Ian Robertson, Director of Property and Environment, BBC

"It is becoming more and more evident that consumers are increasingly interested in the 'world that lies behind' the product they buy. Apart from price and quality, they want to know how and where and by whom the product has been produced. This increasing awareness about environmental and social issues is a sign of hope. Governments and industry must build on that."
Klaus Toepfer UNEP Executive Director[2]

executive summary

tackling the resource productivity challenge

There is an urgent need to reduce the environmental impact of economic activity, as the environmental impacts of resource use, such as climate change, biodiversity loss and air pollution increase. We need to achieve more in economic terms, with less environmental impact – in other words, improving the 'resource productivity' of the economy. But what does a resource-efficient economy look like? The key is to 'decouple' economic growth from environmental impact. This report examines one potential approach to improving the resource productivity of the UK - a new strategic business model, where companies shift from selling products to selling services.

service innovation for sustainability

Traditionally, business profits are tied to increased product sales. If suppliers instead supply a service, rather than a product, alternative opportunities for profit are created. For example, a company could shift from selling barrels of chemicals, to selling the service the chemical is used for, such as cleaning or degreasing. An energy supplier could shift from selling energy to providing a warm home service.

The approach is based on aligning the incentives of customer and supplier. Both should gain from cost reductions derived from improved resource efficiency. It also enables a strategic approach. Through a service model, it is possible to look at the whole system of product use, to see where efficiency gains can be made.

economic and environmental benefits

Services are not necessarily more sustainable than products, but if carefully designed, service offerings can result in significant environmental benefits, such as reduced resource use, waste production and emissions. Clear economic benefits can also be seen. For the supplier, these include improved customer relationships, added-value services, and the opportunity to attract new customers. The customer can benefit from outsourcing of non-core activities, integrated supply chain management and reduced costs.

barriers to service innovation

While the service model has significant benefits, there are barriers to its further uptake that need to be overcome. These include; cultural barriers around changing the relationship between customers and suppliers; budgeting and management tools that hide the full cost of product use; uncertainties around quality and liability issues; a lack of investment funding available for the approach; and the low cost of energy, resources and waste management.

service innovation in action

This report looks at three areas in which the service approach can be used. These are at different stages of development. Chemical management services (CMS) have a proven track record of economic and environmental success in the US and Europe. Energy services have a mixed record of success but has the potential for wider uptake. Agricultural services is at an embryonic stage but again has the potential to result in significant benefits.

Each of these areas are looked at in turn, and details are given of how the service approach operates, the benefits of the service model, barriers to further uptake, solutions and what needs to be done next. Case studies are given in each section, to illustrate real-life examples of the approach.

chemical management services recommendations:

The success of the Chemical Strategies Partnership in the US points to the need for a similar organisation in the EU, to bring together chemical users and manufacturers, trade associations, NGOs and other stakeholders to publicise CMS. In addition, further government-sponsored research on the potential for CMS is needed. To aid the development of such approaches, an assessment needs to be undertaken of the potential for a government-financed chemical audit scheme, to track how chemicals are used.

In addition, the Environment Agency needs to examine the legal definitions of waste to prevent them obstructing service approaches. A chemicals safety co-ordination unit could be used to promote chemical service approaches in appropriate sectors.

energy service recommendations:

Action is needed, firstly, to address the regulatory and fiscal framework that energy services operate in and, secondly, to improve the quality and availability of energy service offerings. An appropriate energy services framework requires: new regulatory and fiscal incentives for energy suppliers to market energy services; incentives for domestic customers to buy energy services; use of building standards to encourage energy services; and further research on the environmental and economic benefits of energy services. This framework will allow energy services to be viable. Work is then needed to ensure that good quality energy services are put on the market. These need to be simple and attractive to consumers.

agriculture services recommendations:

Agricultural services are an emerging and developing area. Measures to test and demonstrate the benefits of the approach, and incentives to encourage uptake, are needed. These include a pilot farm audit scheme on the opportunities for more efficient agriculture, an environmental levy on fertiliser or agrochemical purchases, and a working group of key stakeholders to direct and publicise these activities.

recommendations and conclusions

In addition to the specific recommendations for chemicals, energy and agriculture services, the report identifies a wider set of factors that need to be addressed to encourage the adoption of service approaches. Four broad areas that action is needed in are identified:

- creating a policy framework that encourages service innovation
- information, promotion, support and advice
- development of finance options and better awareness in the financial community for service approaches
- research and piloting.

Green Alliance and other members of the service innovation network will be taking forward this work through a range of initiatives at the UK and European level.

introduction:
tackling the resource productivity challenge

The UK economy is dependent upon the use of raw materials to do business, and our use of resources is expanding. The associated environmental impacts of resource use, such as climate change, biodiversity loss, and air pollution, are increasing. There is an urgent need to reduce the environmental impact of economic activity. This is expressed by the concept of 'resource productivity' – increasing the efficiency with which we use resources, thereby achieving more in economic terms with less environmental impact. In other words, we need to do more with less. The need for improved resource productivity is acknowledged by policy makers and politicians:

"we must reduce the impact of growth on the environment. Some commentators estimate that we'll need a tenfold increase in the efficiency with which we use resources by 2050."
Tony Blair Prime Minister, October 2000 [3]

Like labour productivity, getting more economic output from less resource input also makes business sense. The UK Government recognises the potential win-win for business and the environment, and endorses the idea of a resource-efficient economy. In July 2003, Patricia Hewitt, Secretary of State for Trade and Industry, restated the Government's commitment to the objective of improved resource productivity:

"…we recognise as a government that future prosperity, home and abroad, depends on decoupling environmental pollution from economic growth…we can enjoy more comfort, more enjoyment and more security without automatically increasing harmful and costly impacts on the environment. But it requires a re-thinking of business models to make more productive use of natural resources." [4]

But what does a resource-efficient economy look like? There have been attempts to quantify the level of action needed, often articulated as a four to tenfold increase in the efficiency with which we use resources. The Performance and Innovation Unit (now the Strategy Unit) endorsed these ambitious goals and discussed options for how they might be achieved in its 2001 report on resource productivity [5]. At the 2002 World Summit on Sustainable Development, held in Johannesburg, governments made a commitment to drawing up ten-year action plans for sustainable production and consumption. In October 2003, the UK Government published its contribution, *Changing Patterns: UK Government Framework for Sustainable Consumption and Production*, which commits the UK to 'decoupling' economic growth from environmental degradation, through increased resource productivity, and begins to outline policies to achieve this – though it does not propose specific new policies.

Progress has been made in specific areas. The Energy White Paper [6] called for a doubling of energy efficiency measures. The Strategy Unit report, *Waste Not Want Not* [7], for the first time places waste minimisation, that is to say doing more with less, at the heart of UK waste strategy.

services, not products: part of the resource productivity solution

This report examines one potential way of improving resource productivity in the UK - a new strategic business model, where companies shift from selling products to selling services. Such businesses might offer a warm home service, rather than selling units of energy; or a cleaning service rather than chemicals for cleaning. This business model has the potential to reduce environmental impacts, as profit comes from efficiencies in energy use, material consumption and waste reduction. In this way it is no longer in the interest of the supplier to maximise the volume of physical product sold.

There are already successful examples of this approach, particularly in the United States. This report examines its potential in the UK, based on detailed studies of three sectors – agriculture, chemicals and energy – conducted in collaboration with practitioners, businesses, academics, policy-makers and NGOs. The three areas have shown different levels of success and are at different stages of development. Chemical services have a proven track record in the US, whereas energy services have a more mixed record of success and agricultural services are only at an embryonic stage. However, our conclusion is that the service model has the potential to generate considerable economic and environmental benefits, but that there are a number of barriers to achieving this. The report therefore makes recommendations on the use of regulation and other policy tools to support their further development.

the project

This report is the result of a detailed research project carried out during 2002–2003. It was led by Green Alliance, with TXU, the University of Bradford/UK CEED, Yorkshire Forward and the Chemical Industries Association as project partners. The project builds on earlier Green Alliance work demonstrating the need and options for driving the resource productivity agenda forward, which is published in *Building a Bright Green Economy: an agenda for action on resource productivity*[8].

The project established a practitioners network for individuals from business, government, academia and the environmental movement to come together and share information and understanding of the service model, through a website and email network. In addition, a series of seminars brought together experts with experience of implementing the service model in three main sectors: chemicals, energy and agriculture.

In July 2002, we published an initial research report summarising current thinking on the potential for the service model to deliver more efficient use of resources, *Service Innovation for Sustainability: a new option for UK environmental policy?*[9] This report provided a focus for delegates at the project launch event to identify key issues that needed to be addressed to increase understanding and implementation of the service model.

In February 2003, Green Alliance, in conjunction with the Chemical Strategies Partnership[10], held a major conference on chemical management services[11]. The event brought together representatives from companies in the US and Europe, to share their experiences of implementing the service model. In addition, we held a small seminar with chemical companies based in the Yorkshire region, to identify barriers and opportunities to implementing chemical management services in their businesses.

In conjunction with SustainIT, we held a seminar in March 2003 examining the potential for the service model to achieve eco-efficiency in agriculture and buildings. The event highlighted the important role of information technology in the provision of service offerings. And in July 2003, a final seminar looked specifically at the potential for energy services to decouple the relationship between energy suppliers' profits and volume of electricity sales.

Further information on these events and activities, including notes from the seminars, is available from Green Alliance's website, www.green-alliance.org.uk

service innovation for sustainability

what is service innovation for sustainability?

If we are to achieve meaningful improvements in resource efficiency in the UK, business strategies need to be aligned with the objective of doing more with less. Traditionally, business profits are tied to increased product sales. Reducing sales may lower environmental impacts, but will also lower profits. It is a proposition that even the most altruistic managing director will be unlikely to support. However, a business model in which suppliers instead provide a function or service, rather than simply the product, creates alternative opportunities for profit.

For example, a traditional supplier of degreasing chemicals receives income from selling barrels of chemicals to customers. The more barrels it sells, the more money it makes. Hence, it has no clear economic incentive to improve the efficiency with which the product is used. The customer would like to reduce the cost of degreasing chemicals and therefore have an incentive to use less. However, the costs to the customer in achieving this themselves are high as the process requires specialised knowledge and equipment. The customer also takes on the costs of storing, disposing and otherwise managing the chemicals, which can be considerable.

In a service model, the supplier moves from simply selling the chemicals to providing a defined benefit to the customer, such as supplying degreased equipment at a given unit cost. This involves the supplier taking control of the degreasing process, which gives them the opportunity to reduce costs through using less chemicals or better management. Suppliers can often achieve this more cheaply than users because they have specialist knowledge about their product, and how it can be used.

Similarly, with energy, consumers normally pay for the amount of energy they use in terms of kilowatt hours of electricity, gallons of oil and so on, and buy their own equipment, such as boilers, heaters and air conditioners. But this is just a means to an end. What customers really want is a warm home, hot water or refrigeration. Energy service contracts can provide customers with a defined benefit of this kind, by providing a service without customers having to manage their own equipment. Under this model, suppliers stand to gain financially by increasing energy efficiency within customer's premises. They have more incentive to reduce consumption, and can do so through monitoring and auditing energy use, and using more efficient equipment.

Both these examples highlight some key characteristics of service innovation for sustainability. The approach, firstly, ensures that the incentives of both supplier and customer are aligned around the cost savings from improving resource productivity. Service contracts often have a 'gain sharing' agreement, in which cost reductions are divided between suppliers and customers. Secondly, it no longer separates the individual stages of making, using and disposing of a product – instead, it looks at the whole operation, and can make efficiency savings wherever they work best. Thirdly, because the supplier is replacing or taking more responsibility for the customer's ownership and use of products, it requires much closer levels of involvement and trust between them.

The table below summarises these key characteristics, and some further differences between a product and service based approach. This table refers to the chemicals sector, but is broadly representative of many service approaches.

summary of how the CMS model differs from the traditional supplier-purchaser model [12]

Traditional	Chemical Management Services
Focus on material cost	Focus on lifecycle cost
Volume-based cost	Unit pricing
Volume-based discounts	Sharing of efficiency gains
User-driven chemical management	Supplier-driven chemical management
Arms-length negotiation	Partnership
Opposed financial incentives	Aligned financial incentives
Fragmented approach	Systems approach

The terminology used to describe this kind of service offering has been varied and potentially confusing. Academic work refers to 'product service systems' (PSS) and S^3 – sustainable services and systems, whilst businesses may talk about 'the service model', or 'servicizing'. This project uses the term 'service innovation for sustainability', to make explicit the link between the service approach and sustainability objectives.

economic and environmental benefits

Services, in themselves, are not automatically more sustainable than products. The introduction of services can accelerate the consumption of resources. The service provider and customer need clear incentives to be more efficient in their use of resources – unless the incentives are right, there is no reason why a service model is any more beneficial. For example, leasing products on the proviso that they will be replaced when defective could encourage customers to use them more recklessly, so that they are replaced more often.

The service contract needs to set up the right incentives to deliver environmental benefits. Careful analysis is therefore needed to make sure that any proposed service innovation has an environmental benefit. Our research in three different sectors does, however, show clearly that, when the incentives are right, environmental benefits result. The potential benefits include:

- energy services: increases energy efficiency; reduces greenhouse gas emissions; results in energy source switch; facilitates embedded generation
- chemical management services: Improves chemical use efficiency and reduces the number of chemicals used; encourages substitution of hazardous chemicals; reduces risk and improves health and safety; reduces hazardous waste; more reuse and recycling
- agriculture services: reduces use and toxic pollution of pesticides/fertilisers; less run-off; reduced fuel use for tractors etc and increased biodiversity.

More generally, service innovation encourages better utilisation of products, as suppliers have the incentive to extend the life of products, which can justify expenditure on better quality materials. Additionally, different products can be introduced to perform the service, and these products may have better health, safety and risk profiles. The service model can also result in higher rates of reuse and implementation of recycling schemes to recover valuable materials. This in turn reduces waste.

Of course, these environmental benefits should not been seen as guaranteed outcomes. They will depend on the details of how the service is implemented, and in particular, on whether there is an economic benefit for both suppliers and customers.

The examples within this report show that this can be achieved. They also demonstrate clear business benefits. For the supplier there is the potential for improved relationships with existing customers, with better retention and more value-added; and the potential to attract new customers through a service offering. For the customer service innovation is in line with existing business trends: focusing on core competencies; outsourcing; and value-added strategies such as integrated supply-chain management or lean manufacturing.

barriers to service innovation

Releasing the potential of the service model will require action to overcome some of the current barriers to their development. These are discussed in more detail below for agriculture, chemicals and energy but generic barriers include:

- cultural barriers around changing supplier and customer business models, and nervousness about the new relationships these require
- budget and management structures that hide the full cost of product use
- concerns about how the service approach deals with quality assurance and liability
- attachment to ownership – domestic consumers, in particular, often want more than the service a product provides. They may feel that they gain status through ownership of products, and enjoy the experience of buying and owning things
- investors and analysts favour product-based investment, as they lack awareness and understanding of service approaches
- the low cost of energy, resources and waste management reduces incentives to adopt a service approach.

These barriers are discussed in detail below.

cultural barriers

Service innovation requires a transformation in business relationships and financial structures, representing a huge change in attitude for suppliers and service providers. For a company that has traditionally sold products, switching to a business model based on the provision of services is not an easy task. Customers too have to relinquish control of particular activities to an outsider, and are more dependent on the outsider. However, companies such as Haas TCM have shown that these barriers can be overcome.

case study one: Haas TCM

Haas TCM stopped producing chemicals in 1995, and is now strictly a service provider to 120 facilities worldwide. They have customers in the automotive, aerospace, electronics and aviation industry. Their chemical management service (CMS) offering is based on a total cost approach, recognising that in addition to the cost of purchase of the products, there are additional direct costs, including labour, waste, safety, administration, spill and compliance cost factors.

Haas TCM is able to offer significant benefits to its customers through its CMS offering: cost reduction, chemical use reduction, and in addition, reduced insurance cost. Stan Klocek, Executive Vice President, Haas TCM, stressed that the majority of cost savings are made in management costs, not by squeezing purchasing. This provides a secure financial model - savings made in management costs are repeatable, consistent savings, whereas purchasing costs will always go up and down.

Stan Klocek emphasised that the partnership element of CMS is very important to understand how the customer is approaching the contract. From Haas TCM's experience, CMS does not work best on a fixed fee for service basis, as the customer has no incentive to make changes – a shared gain approach is necessary. In drawing up the financial model, it is also important to link baseline chemicals use to production levels. Over the long-term, the CMS provider continues to make profits from reducing costs, adding new services, or taking over new facilities of the existing customer.

quality assurance

In a business context, a critical issue is quality, and how to guarantee quality assurance in a service offering. In chemical management services, for example, this issue has meant that most programmes only cover indirect chemicals – chemicals used within the customer site for industrial functions such as cleaning, and not on the product line. Case study two illustrates how this has been overcome at the Opel site in Poland, where PPG's contract includes car paint spraying.

case study two: PPG Industries

PPG Industries is a global supplier of coatings, glass, fibreglass and chemicals, offering both products and services. At a new GM/Opel site in Poland, they are implementing a CMS programme that covers direct materials, process management, mix room, logistics, storage, quality control, maintenance, cleaning, indirect materials, consumables and chemical management services. PPG are fully integrated in Opel's processes, with on-site personnel working in process engineering, and operating the plant.

For Andy Benson, Account Manager, PPG Polska, CMS is based on partnership – the mindset of both the customer and supplier has to change. It relinquishes the need of the customer to deal with sub-suppliers (Tier II), as these are dealt with by the business partner – PPG. The CMS programme covers both indirect chemicals – such as the paints used in site facilities, and direct chemicals used on the product vehicles. If PPG want to change the Tier II supplier for an indirect chemical, they can do so without approval from Opel. If it is a direct chemical, PPG needs to obtain engineering approval.

The benefit of CMS, in cost savings and chemical reduction, has been achieved both by changing processes and introducing new materials. Environmental achievements of the programme include reduction in chloride concentration in waste water and a reduction in waste water sludge. In economic terms, the programme is generating cost savings for the customer of € 10,000 per month. In addition to providing a cradle to grave approach, PPG offer hazardous materials expertise, including expertise on local regulation.

GM has five CMS programmes operating in Europe, and is now looking to develop a common approach to CMS across Europe and North America, where CMS is being implemented in 95 per cent of GM plants. Mike Knoblock, Worldwide Facilities Group, General Motors North American Operations summarises the successful integration of CMS into GM as a paradigm shift in the approach to supplying chemical services and a cultural change in the way suppliers are received into the manufacturing team.

attachment to ownership

A product can provide more than just a function – it meets other needs, such as guaranteed availability or status. It is important that service offerings meet these broader customer requirements[13]. Financial leasing packages might not be palatable to consumers who wish to own a product. But effective marketing techniques can overcome this – many mobile phone contracts effectively lease the phone, with annual upgrades, yet the customer feels that the phone is theirs, and is able to personalise it, with different covers for example. This may not be very resource efficient but it does demonstrate that consumer barriers can be overcome.

investment barriers

Members of the project network who have tried to introduce service businesses have found that venture capital is very product-focused at present, not process-focused. Risk-averse venture capitalists can be a key barrier to business development, resulting in an equity gap. There is a need to develop understanding of the potential business benefits of introducing a service offering, amongst senior business executives, venture capitalists and analysts.

resource costs

Underlying these barriers is a fundamental need to ensure that the prices of raw materials reflect their full environmental costs. The relatively low prices of energy, materials, waste management and transport provides little incentive for companies to think more strategically about their use of resources. The more these prices rise to reflect full environmental costs, the greater the level of cost savings generated from a shift to a service model. Alongside other policy instruments, an increase in the cost of raw materials may be the most significant factor in creating a market for service innovation, as customers start to demand this sort of approach from their suppliers.

These barriers, and ways of overcoming them, are discussed in detail in the sections below, covering chemicals, energy and agriculture services. The final section offers more generic recommendations for ways in which service innovation can be promoted.

service innovation in action

1. chemical management services

The chemical management services (CMS) model has been developing and expanding largely within the United States, particularly in the automotive, electronics, aerospace and metalworking industries. The Chemical Strategies Partnership, a non-profit organisation set up to promote the approach, estimated that in 2001 about ten per cent of the US aerospace industry, 20 per cent of metalworking industry, 35 per cent of the electronics industry and 50–80 per cent of the auto industry had adopted this model[14].

This level of take-up suggests that there must be significant benefits to the approach. But it also raises the question of why, if the benefits are so impressive, the approach has not spread more widely beyond the US. This section highlights the benefits to be gained, both economic and environmental, and the barriers to greater uptake in the UK and the rest of Europe. It then makes recommendations for how these barriers can be overcome.

drivers of service innovation

Future regulatory developments in the proposed EU chemicals legislation, (REACH) and the Environment Agency's shift to risk-based regulation, are likely to increase compliance demands on UK companies that use chemicals. Continued tight margins in the sector will also continue to force innovation and cost-cutting, creating opportunities for companies that can deliver these. CMS, a well developed model of service innovation in the chemicals sector, is an approach that can help respond to these pressures.

In the US, the complex environmental and health and safety regulations concerning chemical distribution, use and disposal have been an important driver. Reporting requirements in the US have made it easier to highlight the opportunities of service approaches. Companies such as General Motors have taken up CMS through a desire to address the complexity and number of chemicals they were using in the early 1990s.

Companies in the US have been given a helping hand by the Chemical Strategies Partnership (CSP), which serves as an independent source of information and guidance on developing chemical management service programmes. The independent nature of the CSP has been an important factor in its success, as it can help build trust between suppliers and clients.

CSP's approach to initiating a CMS programme is based on the premise that companies are not aware of the total cost of chemical use. Revealing this cost creates the opportunity to restructure supplier-customer relationships and create new value. CSP has developed an approach to estimating true chemical costs and created a manual, *Tools for Optimizing Chemical Management*, to help manufacturing firms develop a chemical management services programme[15]. This manual provides step-by-step instructions on how to evaluate and design a comprehensive CMS programme.

case study three: Airbus/Castrol

Castrol has both product and service businesses, with separate management teams. They manufacture and supply metalworking and high performance lubricants to the equipment manufacturing industry, and currently have 300 sites worldwide providing fluid management. In the UK Airbus programme, the initial customer for total fluid management was the Airbus maintenance department. They moved from simply outsourcing non-core activities, such as maintenance, to integrating Castrol into the value-chain as part of the entire process. The fluid management system (FMS) at Airbus provides a strategic and unique partnership involving people, products and processes.

Environmental issues provided a significant driver for moving towards FMS. There was very little existing knowledge and data about environmental effects, and little recycling. Other drivers included: risk management; problems with misting; monitoring need; and cost avoidance.

Tina Fairley, Business Development Manager, Aerospace Industries, at Castrol, explained that there have been significant up-front benefits of implementing FMS, but Castrol now faces the issue of how to maintain these benefits. In Phase A, they have introduced recycling and swarf (waste metal from machining) processing, resulting in cost savings of £185,000 per annum, and a 50 per cent reduction in swarf volume, greater risk control and HSE improvements. In implementing Phase B of the Airbus project, the programme will incorporate procurement and management of chemicals, and investigation of cost improvement programmes. Castrol is also planning to take this model to other sites.

In implementing the model, Castrol has faced some difficulties. Primarily, there were cultural barriers to overcome, in undergoing the shift from a commodity/price driven relationship with its customers, to a relationship based on savings through the service programme. Castrol identified some key factors driving successful implementation of FMS projects:

- a partnership approach;
- clarity of common objectives;
- benchmarking results;
- openness of information;
- effective change management;
- recognition that benefits go beyond the product price.

benefits of CMS

CMS is based on full chemical lifecycle costs - material, labour, and waste management - not material costs and volumes. CSP found that full chemical lifecycle costs typically amount to between $1-$10 for every $1 of chemicals purchased[16]. The service offering includes optimisation of a range of processes such as: procurement, inspection, inventory, delivery, use, storage, disposal, emergency preparedness and liability. It thus represents a powerful management tool regardless of environmental benefits. Reduced purchase costs, waste costs, and labour costs all contribute directly to a healthier balance sheet. The process also helps in the assessment and management of the risks associated with chemical use, improving data management, and in some cases reducing insurance costs.

Environmental benefits result from reduced chemical use, using fewer hazardous chemicals and reduced hazardous waste. According to a Chemical Strategies Partnership survey, 80 per cent of CMS customers achieved a reduction in chemical volume[17]. The experience of a Nortel semi-conductor facility in the US illustrates the environmental benefits that can be achieved from a CMS programme. The following results were achieved from a three year programme[18]:

- reduced annual chemical consumption by 50 per cent in two years
- decreased on-site chemical inventory by 50 per cent
- reduced hazardous waste by eight per cent in two years, resulting in savings of $24,000/year
- substituted several chemicals, resulting in savings of $120,000/year
- changed chemical container size, resulting in savings of $55,000/year.

barriers

While the benefits of CMS are clearly significant, it is a challenging business model for both users and suppliers. Barriers occur both within companies and due to the regulatory environment they operate in.

Internally, a lack of understanding of the CMS approach, and of the full costs of current chemicals management, holds back interest. Chemicals purchase is normally a small proportion of costs and therefore a low priority. The hidden cost of chemicals management, which means that total chemical management costs can be up to ten times purchase price, is often not understood. Therefore the chemicals budget is seen as too insignificant for management to focus cost-saving efforts on. Awareness of environmental impacts is also low. Even in US-based companies with European arms, the autonomy of European operations has prevented transfer of CMS know-how.

Externally, the regulatory regime in Europe obstructs further uptake. Europe has a more relaxed regulatory regime than the US model, and this does affect costs. The introduction of REACH may provide the necessary drivers. Another regulatory barrier in the UK is that leasing solvents is very difficult as it presents difficulties in setting up reuse or recycling. The Environment Agency is looking into resolving this issue.

The size of manufacturing plants in Europe is also smaller. This means that suppliers have to deal with a greater number of customers, and that benefits at each plant are smaller.

The case studies in this report demonstrate that CMS is a workable proposition in Europe. But action is needed to mainstream the approach and further understanding of its economic and environmental potential. Whilst it is largely a market-driven model, the barriers cited above can prevent its uptake.

solutions

The role of CSP has been instrumental in the expansion of this model in the US, for example, by running pilot projects to demonstrate the benefits of the model in new sectors, such as metalworking. A UK or Europe wide broker organisation could act as a catalyst for uptake of CMS. A recurrent theme from the Green Alliance seminar on CMS was the importance of partnership, mediated through an independent third-party organisation. This body can build trust between supplier and customer, and ensure the model is successfully implemented. The CMS model is complex, and potential difficulties and differences between supplier and customer need to be overcome. These include ensuring clarity of common objectives, developing appropriate shared gain contracts, benchmarking, openness of information, change management, and recognition that benefits go beyond the product price. There is also a role for an organisation in 'matchmaking' suitable CMS providers and customers.

what needs to be done?

A European equivalent of the Chemical Strategies Partnership needs to be set up. This would bring together chemical suppliers, users, trade associations, NGOs and other stakeholders to publicise the benefits of CMS and to help with its uptake. This body could also be responsible for:

- establishment of a CMS Forum holding regular meetings to promote understanding, exchange of ideas and awareness
- developing pilot CMS programmes to demonstrate the concept's viability in the UK and Europe to highlight its potential
- the potential for development of CMS in important industries such as pharmaceuticals should be investigated
- working with downstream customers to engage their interest and build a market for services.

Government research to highlight the potential of CMS is needed. In Austria, the government has conducted a study into the potential for the CMS model to be applied in the Austrian chemicals industry. The objectives of the study are to decouple economic growth and product turnover, and to ensure that the Austrian chemicals industry is fit for the new EU chemicals policy. A similar scoping project is needed from the UK Government to identify and highlight the potential of CMS in the UK in strategic terms.

The potential for a government-financed chemical audit scheme should be assessed. This would be focused on use and promotion of existing audit tools, rather than the development of new ones. Envirowise's experience in waste minimisation auditing, in which it achieves waste reduction to ten times the value of money invested in it, would make it a suitable host for the scheme[19]. Its aim would be to develop or publicise existing methodologies that reveal total cost of chemical usage, and to encourage and assist companies in using them. The scheme would develop business materials to publicise the availability of these tools and advice services.

The Environment Agency should examine legal definitions of waste to ensure that they are not impeding the increased reuse or recycling of chemicals. Regulatory changes such as the introduction of Integrated Pollution Prevention and Control (IPPC) should also be examined by the Agency to ensure they facilitate and encourage CMS where appropriate.

In the Royal Commission on Environmental Pollution's report Chemicals in Products, a key recommendation is to set up a **chemicals safety co-ordination unit** within the Environment Agency to be used to promote the adoption of chemicals management services in appropriate sectors[20]. Green Alliance supports this recommendation. This unit should have a role in working with the downstream users of chemicals.

The wider policy framework for chemicals and waste needs to **provide fiscal incentives**, that encourage resource efficiency and avoidance of waste. This is discussed in more depth in this report's general recommendations.

2. energy services

The Energy White Paper[21] set a carbon emissions reduction target of 15–25 million tonnes by 2020 and expects energy efficiency to deliver approximately half the necessary savings in both the business and the domestic sector. In the domestic sector, gas and electricity consumption has grown by eight to ten per cent over the last five years. This trend of increasing use, against an expectation of improved efficiency, creates a strong incentive to develop energy services. Energy services could help to improve energy efficiency in the business and domestic sector.

There are significant opportunities for improving energy efficiency in the short to medium term. For example, according to the European energy commissioner, a cost-effective savings potential of around 22 per cent of present consumption in buildings can be realized by 2010[22]. The Strategy Unit concluded that energy efficiency could be improved by 30 per cent if all cost-effective energy efficiency measures were taken by business and individuals[23].

Traditionally, suppliers of electricity, gas and other forms of energy have simply sold a product - electricity or gas - to customers. Customers then use the energy inputs to supply their own functional needs for heating, lighting, manufacturing and so on. By contrast, an energy service offering involves energy suppliers, or intermediary organisations, understanding what a customer actually wants from using energy, eg cold beers and hot food for the household, and providing a package of measures to provide it more efficiently and therefore more cheaply.

These measures might include: changing the mix of energy sources being used; use of information and communication technologies to monitor and meter energy use; simple one-off actions to achieve more efficient energy utilisation such as advice or audits; financing and installation of new equipment - with costs recovered through long-term contracts; or service companies taking complete responsibility for providing customers' end needs. The approach integrates generation, supply and use of energy, which are currently addressed separately. Case study four illustrates how this works for a major retailer.

case study four: Sainsbury's signs energy management contract to reduce energy consumption by 11 per cent

In 2002 Sainsbury's signed a four and a half year contract to outsource its energy management to RWE. The agreement aims to reduce Sainsbury's energy expenditure and improve efficiency[24].

Sainsbury's currently spends in excess of £50 million a year on energy. RWE Solutions UK Ltd will manage a £14.5 million investment programme of energy efficiency measures aimed at reducing consumption by 11 per cent over two years. This programme will contribute to Sainsbury's environmental target of reducing carbon dioxide emissions from its buildings by 10 per cent from 1997/8 by March 2005.

RWE will modify refrigeration systems, review the effectiveness of existing equipment, monitor temperature controls, upgrade lighting infrastructure, and ensure that heating and ventilation systems are operating at optimum efficiency. This project work will be supplementary to Sainsbury's current programme of upgrading the whole of its supermarket estate to the standard of the best.

RWE Solutions will assess energy consumption at all Sainsbury's Supermarkets' properties and develop an intensive energy reduction programme, which will encompass refrigeration, lighting and heating and ventilation projects. RWE Trading Direct Ltd will provide gas and electricity to all Sainsbury's sites in the UK including offices, depots and 458 stores.

Julius Brinkworth, Sainsbury's Group Energy Manager, said of the deal, "RWE is one of the world's leading utility providers. This contract represents an important step in helping us meet our environmental responsibilities and further reduce our expenditure."

William Fortescue RWE Solutions UK Ltd Chief Operating Officer commented, "This is one of the first contracts of its type in the UK to combine commodity supply with a project-driven energy reduction programme. The opportunities provided for both Sainsbury's and RWE are significant and we are looking forward to the opportunity to develop our partnership with Sainsbury's."

Domestic and commercial energy services face very different challenges. Domestic energy services are not well developed. In contrast, in the large industrial and public sector, energy services are well developed in the UK and US (see case study five). A typical offering is a supplier financing, installing and managing electricity and/or heat generating equipment, on the basis of a long-term contract to supply this at an agreed price. Fixed price contracts incentivise the supplier to introduce energy efficiency measures. Often, this equipment is much more energy efficient than the supply options it replaces.

case study five: energy service companies in the US

A recent American study found that Energy Services Companies (ESCOs) – which provide energy services to commercial markets - have grown their revenues by 24 per cent per annum since the early 1990s and completed $1.8-2.1 billion of projects in 2000.[25] The report analysed the results of 1420 ESCO projects over the last decade. Around 73 per cent of the projects were from the institutional sector (schools, universities, hospitals, and state, local, and federal governments).

Lighting was the most prevalent of the 11 'measure categories', installed by 82 per cent of projects. The other main categories were comfort conditioning (68 per cent) and motors/drives. The study found that ESCOs have been successful in achieving energy savings. The report also analysed whether savings had continued after the initial project in a small sample of 29 projects. It found that the majority of projects (72 per cent) actually reported increased electricity savings over time (up to four years). The median simple payback time was seven years for institutional sector projects, and three years in the private sector.

In the domestic sector, while the potential for energy savings is great, as case study six shows, the actual uptake by customers has been low, for reasons we discuss below[26].

case study six: energy services in action

EcoCentroGen Ltd (ECG) specialise in the funding, design, construction and operation of embedded energy generation. Using low carbon and renewable energy technologies from all over the world, an existing or new development will benefit from the delivery of low cost power, heating, cooling and data services.

Working on a number of projects for residential, commercial, industrial, leisure and mixed use sites, the company has completed its first project, has three more in progress and should start on site in the new year on a further three.

This approach to energy services reduces the cost of capital expenditure for the developer, as the primary heating and cooling plant becomes part of the ECG Energy Centre. An element of the infrastructure costs can often be included and the entire site is enabled with data wiring. ECG capitalise these elements and recover their investment over the period of a long-term supply contract, typically between 15 and 30 years.

One such scheme in progress near Manchester consists of 300 apartments and will have all energy and Broadband needs supplied by ECG. Typically, energy bills on the site will be at least ten per cent below grid and conventional supply prices per annum. The very latest in cutting edge digital data services will provide a vast range of broadband, telephony, TV and security services as well as links to social and community services through their site-wide network.

The next development will be the introduction on ECG sites of fully 'bundled' services, where the tenants will pay a fixed subscription rate for both their energy and data. The incentive will be on the Energy Company (ECG) to improve energy efficiency across the scheme, as this will return better profits.[27]

benefits and opportunities

Beyond the obvious environmental benefits of reduced carbon emissions through improved efficiency, energy services can contribute to the flexible provision of energy, and stimulate new models of energy delivery. They can stimulate use of new energy technologies by existing or new energy providers, and novel ways of financing these. For example, in Wales, communities can rent energy infrastructure rather than paying for the energy the infrastructure provides. This can then be used to generate a revenue stream through selling excess energy to the grid which can be used to support local economic development. Energy services can also make it easier to engage consumers in the energy and climate change debate, as they have a direct interest in energy provision.

Energy services can be used to simplify the purchase and use of energy for consumers, with a single energy service bill covering gas, electricity, any other sources of energy, such as microCHP (combined heat and power) and energy efficiency measures.

Domestic energy services can deliver social benefits as well as economic and environmental benefits as a mechanism for addressing fuel poverty. Audit, metering and monitoring of energy usage can identify households suffering fuel poverty. Advice and information can be provided on energy consumption, for example, energy efficiency appliances. Cost savings to the customer and fixed bills allow better household budgeting and contribute to reduced fuel poverty.

Similar benefits apply to business energy services. Contracts are specified in terms of outputs rather than inputs. The service company may provide capital financing for efficiency improvements, which transfers risk to an expert company and frees up management resources to focus on core activities.

barriers

There are some significant barriers to expansion of the energy service model in domestic and commercial sectors.

Domestic customers do not give high priority to energy efficiency. On average, energy expenditure is only three per cent of income, and is not a priority for savings, except among the fuel poor. Energy service offerings are not widely available, and so are unfamiliar, further reducing their appeal. People are also suspicious of what can be called the 'double glazing sales approach', particularly when it involves letting strangers into their home to perform work.

However, before domestic customers even get a chance to buy services, there are barriers preventing service offerings actually being put on the market. The '28 day rule' is regularly cited as an obstacle to service provision, as customers can switch energy suppliers at 28 days notice. Companies that might provide energy services are concerned that the investment they would make in a property is at risk if the customer decides to switch provider. Ofgem, the energy regulator, maintains that the 28 day rule is an important safeguard for the promotion of competition and that it does contain some flexibility, enabling fixed-term supply contracts – for example, both British Gas and Npower have customers on three-year contracts.

More generally, the current regulatory objective of promoting competition on the basis of price makes it difficult to sell longer-term solutions. There is growing evidence that high levels of customer switching result in considerable increases to the marketing and administration costs of suppliers. Eventually, these will be passed on to customers. An alternative approach has been demonstrated in Northern Ireland, which is not a competitive market, where the regulator Ofreg has attempted to set NIE up as the first UK energy services company. It has removed the company's incentive to increase electricity sales, instead encouraging it to reduce customers' bills by providing energy services to run homes and businesses efficiently and at least cost – an example of regulator and supply company working together.

Further barriers for companies thinking of developing services include uncertainty around longer-term policies for sustainable energy, such as the Renewables Obligation, which is not guaranteed to continue after 2010; and uncertainty around the EU emissions trading scheme.

The retail energy market has tight profit margins, and energy services require a more complex offering involving credit, financial services regulation and consumer credit licenses, which deters investment. Capital investment is also seen to be too high, and the payback period too long, given the high levels of customer churn between companies[28]. Structurally there is poor integration of energy services and the energy supply parts of companies, and a lack of technical expertise to implement energy efficiency measures.

Energy services present the opportunity to promote microgeneration. However a number of barriers also exist here. At present, there are no available models in the UK for leasing or service contracts for micro-generation technologies, although BG Microgen looks set to be the first to take this route in 2004[29]. Energy service packages will be essential to the market penetration of these technologies, which currently involve prohibitive capital cost. However, more research and field trials are needed to give suppliers confidence that these technologies will yield revenue certainty under fixed term energy service contracts.

In the business sector, a series of regulatory barriers prevent further uptake of energy services. NETA (New Electricity Trading Arrangements) makes export of excess energy produced by embedded generation uneconomic. This is compounded by a lack of regulatory support from OFGEM. The Climate Change Levy, Renewables Obligation, and Enhanced Capital Allowance schemes could all be used to give better support to energy services than they do now. The planning system could also be used to incorporate the planning gain from energy efficiency more formally.

For both business and domestic services there is currently a lack of fiscal incentives, which could make energy services more attractive to customers. The low price of energy is likely to obstruct greater development of offerings and further uptake of energy services.

solutions

These barriers pose a significant but not insurmountable barrier to the development of energy services. In the absence of regulatory interventions, the price of energy is a fundamental barrier. However, the downward trend in energy prices of the last ten years is probably at an end, and if prices start to increase in real terms, the economics of energy services may improve accordingly. Regulatory opportunities need to be used to promote energy services – for example, Ofgem's electricity and gas price review, and the UK implementation of the EU Directive on Energy Performance of Buildings. Finally, the development of small-scale generation technologies, such as microCHP and photovoltaics, provides the potential to develop new energy services. Energy services can also help to promote these technologies.

what needs to be done?

The regulatory and fiscal framework needs to reward provision of energy services, rather than simple supply of energy. There are two key areas that need to be focused on to drive energy services forward. Firstly, the policy framework in which energy service operate; and secondly, the range, availability and quality of energy services and how they are marketed to the customer.

a. energy service framework

Government needs to develop **incentives for suppliers to market energy services** as there is currently no generalised business case for demand reduction. In the US, this incentive has been generated as suppliers had to share the costs of grid reinforcement for new power plants. A combination of regulatory and fiscal incentives is required. Flexible incentives are likely to be preferred by business, although if used, they must have a mechanism for ensuring delivery.[30] There are lessons to be learnt from the success of the Renewables Obligation and an equivalent mechanism, such as an Energy Efficiency Obligation, could provide the necessary carrot and stick. The feasibility of a similar instrument should be explored in the UK. The Energy Efficiency Commitment is seem as a burden rather than opportunity by energy suppliers and furthermore the mechanism does not seek to fundamentally restructure energy supply. This needs to be taken into account in developing new mechanisms.

Further **fiscal measures** are needed, to incentivise domestic customers, such as energy efficiency information requirements on buyers and sellers of homes, the introduction of a preferential rate of stamp duty for energy efficient homes, council tax rebates and grants for investment in energy efficiency.

Building standards are a clear mechanism for supporting energy services in new build and on refurbishment. Requiring new buildings to be energy service 'friendly' should be enabled through, for example, the implementation of the EU Buildings Directive[31]. Incentives should be created to stimulate appropriate refurbishment of existing buildings, such as the potential for use of VAT to incentivise refurbishment over new build.

The role of financiers in developing energy services is crucially important, and there is currently a lack of understanding and investor confidence in the sector. Research needs to be funded by Government on the reasons for this, and to demonstrate the benefits that can be gained from investing in energy services. This should be publicised in the financial community. There are business issues around the financial structure for energy services and the need to demonstrate a fast payback to investors.

There is a need for further **research and field trials** to identify the carbon dioxide savings and costs associated with energy services. Pilots for micro-generation are needed to demonstrate that they could become self-financing. As with chemical management services and the Chemical Strategies Partnership, an independent body that researches, advises and advocates the benefits of the energy service approach is important. This role is currently provided by the Energy Saving Trust for domestic consumers and the Carbon Trust for commercial customers. Their roles need to be reinforced to provide support for energy services.

Ofgem should champion the role of energy services in delivering strategic energy policy objectives. It needs to work with other regulatory bodies, such as the Competition Commission, to ensure the regulatory framework as a whole is consistent and supportive of energy services.

b. providing better energy service packages

Developing a policy framework that makes energy services economically viable is an essential. The measures suggested in the previous section should make energy service offerings more attractive to customers than traditional energy suppliers. Effort also needs to be put into developing the service offerings put on the market. Ensuring good quality, widely available, energy services requires:

- development of new models and offerings. These need to be simple and attractive, with a one-stop shop approach for customers bringing together service packages, demand reduction offers (micro-generation and energy efficiency), data and advice
- research, to better understand customer barriers to accepting energy service packages and particularly allowing providers into homes
- personal and company carbon accounting tools to allow assessment of impacts
- better training and advice for energy efficiency installers and professionals.

Third parties such as not-for-profit organisations or local authorities could be used as independent brokers in the provision of advice and accreditation. Local authorities are well placed to provide the means to access a number of domestic customers simultaneously, making energy services more financially viable. Through local authorities, different issues such as energy efficiency and fuel poverty can be addressed.

In other sectors domestic customers are used to long term contracts such as mortgages. There is the opportunity to overcome some of the barriers to the provision of energy services associated with the domestic sector by suppliers engaging in strategic relationships, for example, with mortgage companies in the arrangement of finance. Although the area has potential it needs to be developed further.

3. agriculture services

There is growing concern about the environmental impact of agriculture, such as the use of agrochemicals, and leaching and run-off of nitrogen and phosphates. The preliminary evidence suggests that a service solution could help support current and future Government initiatives to deal with these problems.[32]

The trend in agriculture is towards chemicals and machinery that require large capital investment and expertise to use safely and efficiently. This is already creating a number of commercial service opportunities. Examples include contract harvesting or spraying services, based on the fact that specialised suppliers can spread the costs of expensive equipment across a number of users. These do not explicitly or intentionally attempt to reduce environmental impacts, although they may increase economic efficiency through better use of capital assets and reduce environmental impact through avoiding duplication of assets.

The service area of greatest environmental potential seems to be connected with the development of 'precision agriculture'. This provides very detailed information on the characteristics of fields and the crops within them so that various areas within a field can be managed in different ways – hence the alternative name of site-specific management . Precision agriculture is based on very accurate mapping of farms using Global Positioning Systems (GPS), and collection of data on key environmental and crop variables. This can be based on sampling, as with soil types, soil nutrients, and moisture levels; or on real-time sensing data, such as yield data from sensing flows of cereals into combine harvesters, crop health sensing based on the colour of plants; or on satellite data such as crop health based on its light reflection. The maps can then be used to influence farm management, for example, differential application of fertilisers, herbicides or pesticides to parts of a field.

The main physical components of precision agriculture – GPS receivers, specialised electronic equipment and software, control devices in farm equipment and so on – can all be purchased by farmers as stand alone items. In this case, all they will need is occasional specialised inputs such as soil sampling. However, its purchase can seem expensive, and its use difficult. Hence, a number of companies, from agricultural equipment suppliers such as Agco and John Deere, to advisors and information managers such as Soyl (see box), are filling the gap by offering service solutions of various kinds. These solutions currently differ from many service innovations in chemicals and energy, where product suppliers have a greater involvement in (and sometimes taking complete responsibility for) the use of their products, so that they have a direct incentive to reduce their use. Rather, these involve suppliers influencing product use through provision of information and other indirect services. However, it is also conceivable that product-based solutions could also emerge, for example, with agrochemical and fertiliser companies taking complete responsibility for application, with any financial savings from reduced use being shared between them and farmers.

benefits

Precision agriculture has a number of potential environmental benefits. The one which has attracted most attention so far is the application of chemicals only where they are needed, thus minimising use. Advocates claim, for example, that applications of nitrogenous fertiliser can be reduced by up to 34 per cent. It also means that there are records of what chemicals have been applied where. This is important, for example, for UK farmers in Nitrate Vulnerable Zones (NVZs). Farmers in NVZs have to limit the amount of nitrogenous fertiliser they apply to their fields.

Another advantage is reducing dual application or spraying. Dual application happens because the passes of the farm vehicle are not exactly aligned - an important consideration when crop sprayers often now have 23 metre booms.

A useful innovation has been enabling farmers to produce 'profit maps' for their fields, which show the relationship between income (based on crop yield) for a given area and the costs of fertiliser, herbicide and other inputs to it. Areas of low or no profit – which typically include field corners and edges – can then be left out of commercial production and, in a number of cases, have been sown to wild grass and flowers to provide natural habitats for wildlife and to contribute to encouraging biodiversity.

These and other economic benefits have led to substantial take-up of precision agriculture – and associated service provision - in North America, where an estimated 16,000 farms make use of it. However, take-up is still generally low in Europe, including the UK.

Although more work is needed to substantiate the specific environmental (and economic) benefits which precision agriculture and associated service solutions might have in British conditions, the views of many experts consulted for this project are that they have considerable potential.

barriers

Precision agriculture is based on capital intensive, expert systems. As such it may not be applicable to small farms. The start-up costs are also high: it can cost £4,500 - £12,000 to set up. A service-based model would seem to be the only way of reaching small farmers, who could buy in the necessary equipment and expertise through a service offering.

On a practical level, persuading farmers to adopt the approach may be hard, considering only that 50 per cent of farms have a computer, and there are significant levels of suspicion of new technology. There may also be problems with compatibility of equipment and the development of skills, given that time and resources for training are limited in the sector.

Agreeing appropriate contracts is a possible cause of problems. The terms of contract must be clear but flexible, with incentives to ensure environmental benefits yet at the same time allowing service suppliers to recoup investments. Trust is therefore an essential part of the relationship in service provision.

solutions

There are several possible options for overcoming these barriers, of which services is only one. If they are to develop, there are a number of possible routes, including:

- Further growth of 'smart service' providers such as Soyl, based on the provision of information and advice
- Diversification of existing farm support organisations such as agriculture contractors, machinery rings and co-operatives, into leasing of products, taking responsibility for field applications and associated services
- Introduction to the UK of some of the integrated agricultural management solutions which are being developed by North American farm equipment manufacturers.

Paradoxically, further development of the service model may actually be a means of addressing some the barriers listed above. A service model based on partnership could be a mechanism for exposing farmers to new technologies, providing them and others (such as agronomists) with training, and advice on best practice - all through a single package funded by efficiency gains.

what needs to be done?

The following measures would test the applicability of a service solution for agriculture, and provide incentives for precision agriculture and related services.

Defra and the Environment Agency should set up a pilot **farm audit scheme** which would provide advice to farmers on opportunities to minimise fertiliser and agrochemical use through precision agriculture and other means (similar to current energy or water audit schemes for business). The audits would be more focused on environmental objectives than current assurance or inspection schemes.

Introduction of an **environmental levy on fertiliser or agrochemical purchases** would encourage reductions in use by a variety of methods, including precision agriculture if that is the most cost-effective route.

A first step towards these objectives would be to convene **a working group of key stakeholders**, including farmers, regulators, equipment suppliers, food processors, supermarkets, consumers and NGOs, to examine these and other opportunities to speed the take-up of smart agriculture in the UK.

case study seven: Soyl supports precision agriculture in the UK

Soyl Ltd. was established in 1992 by a group of agronomists. The company provides an integrated service to farmers which includes:

- mapping of soil characteristics, nutrients and pH mapping
- SmartYields, an interpretation service which includes an introduction to yield and farm management decisions.
- MultiYields, a software tool which analyses multiple years of farmer's yield data and develops maps of site-specific management zones.
- recommended fertiliser application rates within fields based on nutrient rates.

The company estimates that it has mapped 500,000 acres of land and advised on over 300,000 acres of variable rate nutrient application – including on two organic farms - since its foundation. Its main area of work currently is mapping application of soil nutrients such as phosphate, potash and magnesium. Their levels can vary significantly within a field. Some areas of the field will be habitually high-yielding and hence remove large amounts of nutrients. Low yielding areas will be over fertilised and hence nutrient levels will increase. This leads to possible large differences in nutrient status within any one field. In the case of phosphate, Soyl finds that around 30 per cent of areas mapped see a reduction in application (usually to zero) and 25 per cent an increase – however the latter does not offset the former, because much of the increased application will be taken by 'starved' crops. A recent five year study has demonstrated that Soyl's management approach does level out variations in nutrient levels within fields, and is cost-effective not least because its costs are offset by increased yields and lower overall application of nutrients.

recommendations and conclusions

"Improving resource productivity will require that we invest in new ideas, new technologies and new processes that enable us to create output and value while respecting environmental limits…there is likely to be a need for new institutions, new infrastructures and a shift in attitudes."[34]

As this report has shown, service innovation for sustainability can help to achieve the goal of resource productivity. It is a clear way of reconciling economic and environmental objectives, by decoupling economic growth and impact. Service innovation can assist policy-makers to meet environmental targets on cross-cutting issues. The approach helps decision-makers think more holistically about policy areas, and to put policy decisions into the bigger picture. For example, transport policy can be framed in terms of mobility or accessibility services, rather than whether or not to build a new road.

For business, service innovation is an important mechanism to pre-empt or to respond to environmental and regulatory agendas, including greenhouse gas emissions, chemicals safety, use and disposal, producer responsibility, and waste management. It offers the possibility to introduce new revenue streams and cost savings.

Government has an important role in promoting the service approaches. In some areas it is already commercially viable, in others regulatory and fiscal frameworks prevent viable services being brought to the market.

The previous sections indicate some of the specific barriers to further development of service approaches in the areas of chemicals, energy and agriculture, and how they can be overcome. They also indicate that there are wider set of factors that need to be addressed to encourage the adoption of service approaches. There are four broad areas that action is needed in:

- creating a policy framework that encourages service innovation
- information, promotion, support and advice
- development of finance options and better awareness in the financial community of service approaches
- research and piloting.

creating a policy framework that encourages service innovation

The underpricing of many environmental resources fundamentally reduces the economic viability of many service approaches. The Government has acted in a number of areas to internalise environmental costs into the prices of resources, through mechanisms such as the landfill tax and climate change levy. However, there is plenty more potential for these and other economic instruments to be used to drive service innovation. Introduction of a pesticides tax would drive agricultural services; an incineration tax would increase waste management costs for chemicals and stimulate chemical management services; and differential VAT rates could be used to drive forward energy services.

The regulatory framework also needs to be used to drive further uptake and development of service innovation. New regulatory developments such as the EU directive on energy performance in buildings or IPPC should be seen as an opportunity to institutionalise service approaches. Clear guidance is needed from Government to regulatory bodies to ensure that they remove obstacles to service innovation, and more positively encourage it. This may require fundamental change in some aspects of the guidance given to statutory regulators. The DTI's review of Innovation Policy should look at promoting innovation in business models, such as service innovation, rather than just focussing on technological innovation.

Service innovation needs to cut across government policy and activities. The Private Finance Initiative (PFI) is a mechanism that could and should be used to develop service approaches that explicitly address sustainability through long term contracts specifying environmental gains. Central and local government procurement can be used as a means of developing demand for services, particularly in the area of energy.

The product policy debate is a complement to the development of service innovation, particularly in the area of domestic energy services. The service approach focuses on the efficiency and system of use, but this will involve using products that can be made more efficient. The development of the integrated product policy agenda and producer responsibility initiatives should be used to promote more energy efficient products and should also be linked to the development of the service approach.

information, promotion, support and advice

Bodies that provide independent advice on service innovation and promote it to appropriate companies can play an important role in developing service models. As this project has shown, even a low level of resourcing can achieve a significant amount in terms of promotion and awareness. Organisations such as Envirowise, the Energy Saving Trust and the Carbon Trust should be given additional resources to promote service approaches in waste management and energy. These bodies need to promote the tools that already exist to reveal the cost of product based approaches.

development of finance options and better awareness in the financial community for service approaches

There is a need to raise the level of awareness in the financial community of service innovation and resource efficiency more broadly. Further work needs to be done to target this sector to raise awareness of the opportunities for investment. Fiscal and regulatory changes will be important in directing investors' attention to service approaches. Business schools, MBA courses and training for financial advisors should also be used to promote understanding of service innovation for sustainability to the business community.

research and piloting

There is a need to further demonstrate the benefits of the service approach in the UK and European context. Pilots need to be run, with a focus on demonstrating that the service approach can become an accepted part of business management. There is a need for collaborative research and development between producers and customers, to work together to stimulate innovation that meets customers' needs, and results in resource efficiency.

next steps

In addition to the initiatives undertaken by other members of the Service Innovation for Sustainability Network, Green Alliance will be taking forward this work in the following ways:

- Examining the potential to promote chemicals management services at a regional level, in partnership with a Regional Development Agency
- Linking with colleagues across Europe to formulate an EU-wide model of chemicals management services, in order to meet the challenges posed by the EU REACH regulations on chemicals
- Taking forward the debate on energy services, to look in particular at how energy service packages can be used to promote micro-generation technologies such as solar PV and micro combined-heat-and-power

For further details of these new initiatives, please contact Green Alliance.

notes and references

1. Quote from speech by Secretary of State for Trade and Industry, Patricia Hewitt to Green Alliance/ERM Forum 14 July 2003. Full speech available from www.green-alliance.org.uk
2. Quote from *The Role of Product Service Systems in a Sustainable Society* by United Nations Environment Programme, Division Of Technology, Industry and Economics, Paris, available from www.uneptie.org/sustain/design/pss.htm
3. Quote from speech to Green Alliance/CBI conference by the Prime Minister Tony Blair, October 2000. Full speech available from www.green-alliance.org.uk
4. Quote from speech by Secretary of State for Trade and Industry, Patricia Hewitt to Green Alliance/ ERM Forum 14 July 2003. Full speech available from www.green-alliance.org.uk
5. *Resource productivity – making more with less*, Performance and Innovation Unit (now the Strategy Unit), 2001.
6. The Energy White Paper, *Our energy future – creating a low carbon economy*, DTI 2002. Available from www.dti.gov.uk
7. *Waste Not, Want Not: a strategy for dealing with the waste problem*, Strategy Unit, November 2002.
8. *Building a Bright Green Economy: an agenda for action on resource productivity*, Green Alliance, October 2002.
9. *Service Innovation for Sustainability: a new option for UK environmental policy?* Green Alliance, July 2002. Available to download from www.green-alliance.org.uk/Programmes_ServiceInnovation.htm
10. Further details of the Chemical Strategies Partnership are available from www.chemicalstrategies.org
11. Chemical Management Services: Greening the Supply Chain seminar held on 25 February 2003. The presentations and notes of the discussion from this event are available from www.green-alliance.org.uk/Programmes_ServiceInnovation.htm
12. See Oldham, J and Votta T, *Chemical Management Services: Greening the Supply Chain*, forthcoming in Greener Management International: The Journal of Corporate Environmental Strategy and Practice.
13. live|work are a service Innovation and Design company that aim to overcome the attachment to products through creating 'future services that equal and surpass the quality and desirability of today's products'. See www.livework.co.uk
14. Chemical Management Services Industry Report 2000, Chemical Strategies Partnership, San Francisco, 2000.
15. Available from www.chemicalstrategies.org/csp_manual.htm
16. Votta T., R. Broe, A. White, and J. Kauffman Johnson. 1998. Using environmental accounting to green chemical supply contracts. *Pollution Prevention Review* (Spring): 67:68.
17. Chemical Management Services Industry Report 2000, Chemical Strategies Partnership, San Francisco, 2000
18. See note 16.
19. For more information on Envirowise see www.envirowise.gov.uk
20. See Chapter 4.107, Royal Commission on Environmental Pollution, Twenty-fourth Report *Chemicals in Products - Safeguarding the Environment and Human Health*, June 2003.
21. The Energy White Paper, *Our energy future – creating a low carbon economy*, DTI, 2002. Available from www.dti.gov.uk
22. CIBSE briefing no. 6 The Energy Performance of Buildings Directive A summary of its objectives and contents available from www.ukace.org/pubs/reportfo/CIBSE_EUBD.pdf
23. *The Energy Review*, Strategy Unit, February 2002.

24. This information is taken from a J Sainsbury News Release 08 July 2002 http://www.j-sainsbury.co.uk/media/news_view.cfm?article=284
25. Goldman, C., Osborn, J., Hopper, N., and Singer, T., *Market Trends in the U.S. ESCO Industry: Results from the NAESCO Database Project*, Berkeley, CA: Ernest Orlando Lawrence Livermore Laboratory, 2002.
26. Chesshire, J. (ed.), *From Electricity Supply to Energy Services: Prospects for Active Energy Services in the EU*, Report Prepared for the European Commission - Directorate General Energy and Transport - and Union of the Electricity Industry, Brussels, 2000. Available from public.eurelectric.org/Content/Default.asp?PageID=101; Macklon, D., *Energy Services in the UK Domestic Sector: Barriers to Development and Recommended Action Plan*, London: DTI, 2000 available from www.dti.gov.uk/energy/gas_and_electricity/consumer_policy/service_barriers.shtml.
27. See www.ecocentrogen.com for further information on EcoCentorGen.
28. OFGEM Factsheet 7: *Future Regulation of domestic gas and electricity supply markets* states that 40 per cent of UK consumers have changed suppliers since deregulation.
29. BG MicroGen are marketing a microCHP system which is being developed for homes and small business premises. Like a conventional boiler it produces heat and hot water but it also generates electricity at the same time from the same energy input. See www.microgen.com for more details.
30. Green Alliance's work on negotiated agreement discusses the problems associated with voluntary or negotiated approaches. *Negotiated Agreements: best practice checklist and Signed, sealed and delivered? The role of negotiated agreements in the UK* are both available from Green Alliance
31. The Energy Performance of Buildings Directive (Directive 2002/91/EC) came into force on 4 January 2003. It will greatly affect awareness of energy use in buildings, and is intended to lead to substantial increases in investments in energy efficiency measures. See CIBSE briefing no. 6 *The Energy Performance of Buildings Directive A summary of its objectives and contents* for further details available from www.ukace.org/pubs/reportfo/CIBSE_EUBD.pdf
32. We are grateful to John Sartain of Gotech Technology Ltd and Dr Eike Stefan Dobers (Visiting Scientist) at the Silsoe Research Institute Biomathematics Group for the comments and input they provided to this section.
33. Home-Grown Cereals Authority, Project Report No 267, *'Precision Farming' of cereal crops*. 2002.
34. See page 9 of *Resource productivity – making more with less*, Performance and Innovation Unit (now the Strategy Unit), 2001.