paint the town green
a case for sustainable innovation

January 2010
Forum for the Future, the sustainable development charity, works in partnership with leading businesses and public service providers, helping them devise more sustainable strategies and deliver new products and services which enhance people's lives and are better for the environment.

This report is based on the result of a collaboration between Forum for the Future, ICI Paints AkzoNobel and Carillion

**Forum for the Future:** Ben Kellard, Chris Sherwin, Clare Jenkinson, David Aeron-Thomas, David Mason, Kristoffer Lundholm, Peter Price-Thomas

**ICI Paints AkzoNobel:** Brian Pembroke, David Brunt, Louise Heather, Phil Taylor, Simon Major

**Carillion:** Jas Dhami, Stuart Mee

Forum for the Future is a registered charity and a company limited by guarantee, registered in England and Wales.

**Registered office:** Overseas House, 19-23 Ironmonger Row, London, EC1V 3QN, UK.

**Registered charity number** 1040519

**Company limited by guarantee** 2959712

**VAT registration number** 677 7475 70

**Date of publication:** January 2010
<table>
<thead>
<tr>
<th>contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>foreword</td>
</tr>
<tr>
<td>introduction</td>
</tr>
<tr>
<td>sustainability: today’s challenges, tomorrow’s innovation</td>
</tr>
<tr>
<td>profiting from sustainable innovation</td>
</tr>
<tr>
<td>sustainable innovation in action</td>
</tr>
<tr>
<td>how to get started</td>
</tr>
<tr>
<td>innovation at Forum for the Future</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>foreword</td>
<td>4</td>
</tr>
<tr>
<td>introduction</td>
<td>5</td>
</tr>
<tr>
<td>sustainability: today’s challenges, tomorrow’s innovation</td>
<td>7</td>
</tr>
<tr>
<td>why innovation?</td>
<td>7</td>
</tr>
<tr>
<td>why innovation for sustainability?</td>
<td>7</td>
</tr>
<tr>
<td>why paint?</td>
<td>8</td>
</tr>
<tr>
<td>profiting from sustainable innovation</td>
<td>9</td>
</tr>
<tr>
<td>new paints – Ecosure and Ecosense</td>
<td>10</td>
</tr>
<tr>
<td>packaging improvements</td>
<td>11</td>
</tr>
<tr>
<td>take-back service &amp; recycling</td>
<td>12</td>
</tr>
<tr>
<td>wash up and brush up – environmental wash system</td>
<td>13</td>
</tr>
<tr>
<td>closing the water-loop</td>
<td>13</td>
</tr>
<tr>
<td>enabling innovation – building internal capacity</td>
<td>14</td>
</tr>
<tr>
<td>sustainable innovation in action</td>
<td>15</td>
</tr>
<tr>
<td>laying the foundations</td>
<td>15</td>
</tr>
<tr>
<td>supplier innovation</td>
<td>17</td>
</tr>
<tr>
<td>within the factory gates</td>
<td>18</td>
</tr>
<tr>
<td>packaging &amp; delivery</td>
<td>19</td>
</tr>
<tr>
<td>during use: customer impacts</td>
<td>21</td>
</tr>
<tr>
<td>beyond the grave</td>
<td>23</td>
</tr>
<tr>
<td>how to get started</td>
<td>25</td>
</tr>
<tr>
<td>innovation at Forum for the Future</td>
<td>26</td>
</tr>
</tbody>
</table>
The ZEE project has been a great success for our Decorative Paints business. In terms of specific deliverables it has given us two useful tools: a Streamlined Life Cycle Analysis tool that we are using to assess the sustainability profiles of our current product portfolio and identify opportunities for improvements in our raw material sourcing, manufacturing and product distribution strategies; and an Environmental Impact Analyser tool for the pragmatic assessment of embodied carbon, generated waste and water usage profiles.

The application of these tools has guided the development and positioning of several new product ranges, including our Dulux Trade Ecosure® waterborne paints in the UK and Dulux Valentine Oxygene® waterborne paints in France.

The project also inspired the development of a new Dulux Trade Environmental Wash System, which helps professional decorators and contractors achieve best practice in their waste management by converting waterborne paint washings into clear water and solid waste, allowing for easier control and disposal.

As important as the direct innovative product opportunities that the ZEE project has provided us with, is what we have learned about the way we approach and assess the environmental impact and sustainability aspects of product development. The ZEE project may have come to an end for us, but its legacy will endure as we begin to adapt and roll out the tools and methods it has provided us with across the rest of our coatings businesses.

Graeme Armstrong
Director & Functional Head of Research, Development & Innovation AkzoNobel
introduction

This is a report about sustainable innovation in action. It explains how to conduct innovation driven by environmental and social responsibility, and why it makes good business sense.

We present the results of a three-year research project to develop sustainable paint systems and the business benefits they achieved. We believe that the methods we used are widely applicable and can easily be transferred to other sectors. And if great things can be done on sustainable innovation with paint, imagine what we can do with other products or services like cars or mobile phones, holidays or homes.

The project, which ended in 2009, set the ambitious goal of covering the full life cycle of the target product – decorative paint – with the overarching vision of delivering truly sustainable paint which enhances the life of painted materials without any negative environmental or social impacts.

tangible outcomes

The project was a collaboration between three partners: ICI Paints AkzoNobel2, a paint manufacturer and supplier; Carillion, a paint specifier and user; and Forum for the Future, sustainable development and innovation experts. It has achieved a range of tangible outcomes, generating more sustainable products and processes, cash savings and other business benefits:

- Starting with Ecosure in 2008, ICI Paints AkzoNobel developed and launched a new range of paints with a greatly reduced environmental impact. In 2009 it rolled these out to its mainstream ranges, making significant reductions in the carbon footprint of two of its highest selling retail paints. And in March 2010 the company will launch Ecosense, a new retail paint range with half the carbon and water footprint of the comparable Dulux Standard Matt 2008 formulation, a 40 per cent reduction in waste, and virtually no volatile organic compounds.
- ICI Paints AkzoNobel has launched new products and services to save energy, resources and waste: improved cans; a packaging collection and recycling service; a closed-loop water cleaning system for brushes and rollers; and manufacturing improvements which save millions of litres of water used in cleaning production equipment.
- New tools to facilitate sustainable innovation have been developed and embedded into product development procedures at ICI Paints AkzoNobel. These help companies make detailed comparisons of different design options in product and packaging development and quickly identify the most sustainable options.
- And the project has built its partners’ capacity to innovate sustainably, by introducing staff to new methods, developing internal collaboration, and building networks across the product life cycle.

background

The formal title of the project was ‘Identification, Design and Delivery of Zero Emissions Paint Systems’. Zero emissions was defined as “waste of any description – solids, liquids or gases (including greenhouse gases) – that have direct or indirect adverse consequences for the environment.” Hence the focus of the project became to develop a paint system without harmful emissions that can help the construction sector to become emissions-free.

The project, known as Project ZEE, was co-funded by the Technology Strategy Board’s Collaborative Research and Development programme – (TP/4/ZEE/6/I/21165) – following the open competition ‘Towards Zero Emissions Enterprise’.

The Technology Strategy Board (TSB) is an executive body established by the government to drive innovation. It promotes and invests in research, development and the exploitation of science, technology and new ideas for the benefit of business – increasing sustainable economic growth in the UK and improving quality of life.

2 ICI Paints, part of Imperial Chemical Industries Limited, is now an AkzoNobel company.
In the section ‘sustainable innovation in action’ (p 15) we examine each of these areas and describe the process we use to incorporate sustainability into innovation. We offer a set of tried and tested approaches, methods and tools, which practitioners can add to their existing toolkit, and we show how they can be combined in a larger project.

This publication, and the project it is based on, is all about sustainable innovation and sustainable paint, but is it all genuinely ‘sustainable’ in its truest sense? No – the world is still waiting for a zero-emissions paint. But the project has moved us several significant steps forward, created a platform to build on, and developed its own momentum.

It would be missing the point to think that the project has failed because it did not achieve its goal – a truly sustainable paint system. The bold ambition was critically important, as it helped lead to greater leaps in thinking and produce tangible – even amazing – results. These show the true value of a project whose great strength has been in actually doing, rather than theorising on, sustainable innovation.

By working in partnership, we have been able to understand the opportunities for sustainable development across a paint’s total life cycle. We have been able to turn this understanding into tangible outputs: paint products, paint packaging solutions and paint service offerings that have delivered a combination of sustainability and financial benefits. It has produced a firm foundation for future plans and innovations.”

David Brunt (Global Environment & Sustainability Director, ICI Paints AkzoNobel)

This report is intended for business leaders and decision-makers who own the R&D and innovation process or who drive new technology and product or service development in their organisations. We set out to make the business case for sustainable innovation, using this project to show what can be achieved. The key results and outcomes are covered in the section ‘profiting from sustainable innovation’ (p 9).

It is also intended for innovation practitioners. The project began with an initial study to explore and define the issues to be tackled in detail. This sustainability analysis identified five areas of focus.

**five areas of focus**

1. **Supplier innovation** – incorporating sustainability into purchasing processes and actively engaging suppliers to help them minimise their impacts from sourcing, processing and transporting raw materials.

2. **Within the factory gates** – developing new ways of formulating and producing safe high-performance paints with a reduced climate, water and waste footprint.

3. **Packaging & delivery** – understanding and minimising the sustainability impact of packaging and delivery.

4. **During use: customer impacts** – eliminating negative impacts on health and the environment from the application of paint.

5. **Beyond the grave** – eliminating waste and other sustainability issues at the end of the products’ life spans.
sustainability: today’s challenges, tomorrow’s innovation

why innovation?

Forum for the Future defines innovation as ‘new ideas that work’. It is critical to how economies develop and grow, how new markets are created, how societies are seen to develop and mature and how companies compete and satisfy new customer needs.

There are different ways to understand and carry out innovation – through brands, technology, processes and business models – as well as different levels and ambitions for it. Innovation guru Clayton Christensen distinguishes ‘sustaining’ innovation – building from current technology, markets and capabilities – from ‘disruptive’ innovation – creating new technology, markets and needs.³

Getting innovation right can be critical to a company’s long-term survival. Emerging issues challenge companies to continually revisit and redefine their approaches to innovation: the pace of technological change; new customer needs and societal trends; the rise of digital and open source technology; and the emergence of the East as a manufacturing and innovation power-house.

Yet there is a set of issues at least as influential – the key challenges of the 21st Century, we would argue – which are often not yet on a company’s innovation radar. These are the challenges of sustainable development.

why innovation for sustainability?

Climate change, poverty, pollution, resource shortages, waste, loss of biodiversity and other sustainability issues offer some of the biggest challenges the world faces.

Smart companies and visionary innovators increasingly see these challenges as opportunities. A promising new clean and green technology revolution is in its infancy, while leading companies like Philips, P&G and GE are setting hard business targets to stimulate sustainable innovation and launch products systematically.

Forward-looking leaders can act on these issues in two ways:
• reduce the sustainability impacts of their current products or services;
• focus their innovation capabilities on solving these sustainability challenges.

And there is a growing body of evidence that a focus on sustainability can pay off in a variety of ways: increased efficiency and lower costs; new products, services and markets for a low-carbon world; stronger brands and greater public trust; and a more future-proofed business.

We believe an understanding of sustainability offers progressive companies a huge competitive advantage. Rather than simply seeing a set of issues to manage, measure and monitor, ‘innovation drivers’ such as climate change and resource shortages help companies look at the world through new lenses and reinvent many aspects of their business activities.

We will need new ways to live, work, produce and consume, and a completely new generation of more sustainable products and services, which in turn will require new thinking and creative approaches. That’s why, maybe more than anything else, we see sustainability as a challenge to innovate.

why paint?

the challenges of paint

Decorative paint seems an odd place to start a project about sustainable innovation, yet paint is quite literally all around us. Every year roughly 400 million litres of paint are sold in the UK alone. It covers the walls and surfaces of our homes, our offices, our factories and our hospitals. It helps to protect us, to please us and to bring longer life to the surfaces and buildings it covers. It helps provide aesthetic pleasure, belonging and identity.

the impact of paint

Like most products, decorative paint has a number of negative impacts from a sustainability perspective:

• Some ingredients used in decorative paints are energy-intensive to produce and can generate waste and use significant amounts of water during their extraction and processing.
• Several raw materials, like synthetic binders, come from fossil fuels – a non-renewable resource.
• Most paints, and especially solvent-based paints, release volatile organic compounds (VOCs), a potent form of greenhouse gases which contribute to climate change and can be bad for people’s health.
• Most paint packaging is sent to landfill as solid waste after use because there is currently no efficient system for reuse or recycling. Paint tins are difficult to recycle because leftover paint residues are hard to separate from the packaging material.
• Cleaning brushes and rollers in running water uses a large amount of water and creates pollution which goes straight into the mains.

Beyond those direct impacts, paint can also increase waste by making it harder to recycle any material it covers. There is currently no procedure for recycling or reusing most painted surfaces, which is a major concern since construction waste is estimated to make up at least a third of the UK’s total waste to landfill.

But should we be painting such a bad picture? Paint can have positive benefits too:

• A primary purpose of paint is to extend the lifetime of the surface materials such as wood or plasterboard that it covers.
• Painting can be a cheap, easy and sustainable way of redecorating – avoiding the need to rebuild and all the materials, energy and waste that go with that.
• Choices of colour have emotional benefits, while high levels of light refraction in a painted room (the lighter the colour, the better) can reduce the need for electric lighting and the energy to power it.

US scientist Hashem Akbari goes further in championing paint, arguing that its application can help tackle climate change on a macro scale. He has estimated that painting roofs and other suitable surfaces white would bounce 0.03 per cent of sunlight off the earth’s surface, saving 44bn tonnes of CO₂ – the equivalent of the next decade’s global rise in emissions. In this sense paint can also be a real ‘enabler’ of sustainability.
In this section we set out to make the business case for sustainable innovation, using the project to develop sustainable paint systems to show what can be achieved. This will be especially relevant to business leaders and decision-makers who own the R&D and innovation process or who drive new technology and product or service development in their organisations.

There is now a strong and growing body of evidence demonstrating the business benefits of sustainable innovation. For a start, companies can cut costs and save money by making their products or processes more efficient, reducing the use of materials, and eliminating waste. Carpet manufacturer InterfaceFLOR estimates that it has saved some $400m in avoided waste costs as a result of their internal environmental improvement programme (QUEST)⁴.

Showing leadership and innovation on sustainability is also recognised to enhance company reputation and add to brand value. BT estimated that its Corporate Social Responsibility (CSR) initiatives account for over 25 per cent of the brand and reputation drivers of customer satisfaction, meaning improved CSR performance directly improves customer satisfaction and increases loyalty to the BT brand.⁵

Sustainability leadership can also win you business. BT goes on to suggest that it won £2.2bn worth of new business in 2007-2008 as a direct result of its commitment to the sustainability agenda⁶.

And consumers are beginning to wake up to sustainability too. Recent segmentation studies by DEFRA (the Department for the Environment, Food and Rural Affairs) in the UK, and The Climate Group in the UK and US, show that in both countries a majority of people have some level of willingness to act more sustainably⁷. This shows that sustainability is now a mainstream issue for consumers and suggests that large numbers are looking for a supply of better and more sustainable products and services. Philips Electronics has recognised the size of this business opportunity by setting itself a target of making 30 per cent of overall sales revenue from its Green Flagship, best in class eco-products by 2012. They accounted for 25 per cent of sales revenue in 2008⁸.

All these examples give a broad picture of how business can benefit from working actively on innovation for sustainability. In the following pages we give specific examples of what can be achieved, showing the outcomes of the paint project and their benefits.

new paints – Ecosure and Ecosense

The paint project led to the creation of the Dulux Trade Ecosure waterborne paint – a new eco-paint range launched in May 2008 – offering both high performance and a reduced environmental footprint, with significantly lower embodied carbon, water and waste than previous formulations. The environmental improvements were achieved through a combination of measures: switching high- for low-impact ingredients; selecting suppliers with a better sustainability performance; and making efficiency improvements in manufacturing.

ICI Paints AkzoNobel intends to roll out the learning and technology featured in the Ecosure range to its entire portfolio. In 2009 it launched reformulations of two of its highest selling retail paint ranges – Dulux Matt Colours and Pure Brilliant White in the UK without compromising on quality. And in March 2010, it will launch a new retail range – Dulux Ecosense. The Ecosure formulation has also been rolled out to France and the Netherlands.

These paints have been developed using the Environmental Impact Analyser (EIA), a tool created by Forum for the Future to help companies to make rapid improvements in the sustainability of products. It allows businesses to swiftly compare an existing product against a proposed new one and quantify the difference in carbon, water and waste. More information about the EIA and how these reductions were made can be found on page 18.

business benefits

The EIA has allowed ICI Paints AkzoNobel to make rapid improvements. The first generation of Ecosure paint cut embodied carbon, water and waste by 25 per cent compared with the previous formulation, while achieving equal performance in durability, spreading rate and coverage. A year later an updated formulation took the carbon reduction from 25 per cent to 35 per cent.

In 2009 ICI Paints AkzoNobel began rolling out improvements to its highest selling ranges. It achieved a 30 per cent reduction with the reformulation of Dulux Matt Colours and a 15 per cent reduction in Dulux Matt Pure Brilliant White compared with 2008 formulations, cutting CO₂ emissions associated with these paints in the UK by 7,000 tonnes a year (based on 2008 sales figures).

Ecosense, the latest product, is virtually free of volatile organic compounds and boasts a 50 per cent cut in embodied carbon and water and a 40 per cent reduction in waste compared with the Dulux Standard Matt 2008 formulation. The range is aimed at the retail market and will be sold through leading DIY stores.

In 2009 ICI Paints AkzoNobel began rolling out improvements to its highest selling ranges. It achieved a 30 per cent reduction with the reformulation of Dulux Matt Colours and a 15 per cent reduction in Dulux Matt Pure Brilliant White compared with 2008 formulations, cutting CO₂ emissions associated with these paints in the UK by 7,000 tonnes a year (based on 2008 sales figures).

Ecosense, the latest product, is virtually free of volatile organic compounds and boasts a 50 per cent cut in embodied carbon and water and a 40 per cent reduction in waste compared with the Dulux Standard Matt 2008 formulation. The range is aimed at the retail market and will be sold through leading DIY stores.
packaging improvements

The paint project has also created several improvements to paint packaging. These range from incremental changes to existing formats, to trials of radical new formats unlike anything in the market today.

Simple design changes have helped create a lighter weight can, saving materials. The 10-litre plastic can is now 13 per cent lighter than previous designs and the 2.5-litre can is 7 per cent lighter. In addition, Ecosure paint cans contain 25 per cent recycled plastic content, reducing the amount of energy needed to produce each one.

Another improvement is the development of a ‘ringless’ can, designed to make recycling easier. The inner ring was originally developed to add structural strength, but it trapped paint residues. Removing this makes it easier to clean cans for recycling.

The most radical packaging concept studied in this project is the development and testing of a 500-litre bulk paint container. This solution, which is now undergoing technical testing, has the potential to reduce packaging by up to 98 per cent as most of the bulk-packaging unit can be reused for years. This solution would also help cut the number of paint deliveries that are made to construction sites, reducing transport emissions and costs.

business benefits

The new packaging designs all have the potential to produce significant business benefits:

- Once ICI Paints AkzoNobel has rolled out the two lighter cans across all packaging, the company could save around 140 tonnes of plastic and 270 tonnes of carbon emissions per year in the UK business alone (based on 2008 sales figures). And the improved designs will also save more than 500 tonnes of water and 10 tonnes of waste associated with the production of the cans.
- The new designs of paint packaging should reduce exposure to volatile commodity prices: in 2007 and 2008, the market price for raw material polypropylene fluctuated between £715 and £1105 per tonne.
- The ringless can design has the potential to reduce customers’ costs since the design allows the packaging to be recycled rather than sent to landfill.
- The bulk packaging container could generate substantial business benefits by eliminating the need to produce large numbers of cans altogether.
## take-back service & recycling

The paint project addressed current issues with the take-back and recycling of paint packaging. Most paint cans currently go to landfill for three main reasons: leftover paint residues are hard to remove, making it difficult to recycle used cans unless they have been meticulously cleaned; wet paint is often considered a hazardous substance which can create problems in the waste stream by contaminating other materials; and there is no well-developed system for collecting paint cans for recycling.

The project developed two solutions to these issues:

In 2009 ICI Paints AkzoNobel launched a packaging take-back service in its Dulux Decorator Centres (DDC) allowing trade customers to hand in empty or part-full cans for recycling, and for leftover paint to be disposed of responsibly. The scheme makes efficient use of the existing delivery network – vehicles delivering new cans bring back used cans on their return journey.

The project also developed a new can-recycling process with Avanti, an expert recycling, re-use and re-processing company. This generates material of such high quality that it can be used directly in new cans. One of the main reasons for this is that the paint cans returning via the take-back scheme are separated from other materials. For now, recycled plastic is mixed with virgin plastic, but once the scheme reaches a sufficient volume it will become financially viable to turn old cans into new cans, without the supplement.

### business benefits

The combination of a take-back service and new recycling process brings many benefits. It provides lower-cost materials and reduces energy use. At scale, it has the potential to effectively ‘close the loop’ on packaging material flows, making ICI Paints AkzoNobel less reliant on virgin raw materials from fluctuating markets. If the take-back scheme proves successful it may also enable ICI Paints AkzoNobel to explore the move from can recycling to a model of reuse and refill.

By diverting waste from landfill the scheme also helps customers avoid the ever-increasing UK landfill tax and reduces future risks from EU legislation. It also provides visible evidence of the responsible handling of paint waste – something which has become more important since the 2008 legislation requiring site-waste management plans for all construction projects over £300K.

A recycling company, Avanti, has managed to develop a new recycling process for paint cans. The quality of the recycled material remains so high that new cans can be made from 100 per cent recycled material.

Packaging take-back service

- Diverts packaging from being sent to landfill to be recycled instead
- Responsible handling of leftover paint
- Utilising reversed logistics minimizes cost and emissions
wash & brush-up – environmental wash system

Water consumption and contamination are growing problems for the construction sector. For example, each time a brush or roller is cleaned, it uses – and contaminates – an estimated 25-150 litres of water. Imagine this water consumption scaled up to a large construction site using 5,000 tins of paint.

The real concern, however, is the pollution that this water causes if it is released into the drains, because while solid paint is relatively harmless, liquid paint, especially solvent-borne paint, is considered a hazardous substance. A WWF poster campaign highlighted this in 2007 warning that: “A single tin of paint can pollute millions of litres of water.”

The Environmental Wash System was developed to address these problems and launched in the UK market in 2008. It is a mobile cleaning station, that uses water to wash brushes, rollers and other equipment, and then separates it into solid waste and clean water. This prevents contaminated water being released into the drains.

business benefits

The Environmental Wash System provides contractors with a way of responsibly cleaning equipment on-site. By doing so it helps the contractor to satisfy more stringent demands on site-waste management and reduce the risk and costs of being fined.

closing the water-loop

The largest and most innovative manufacturing improvement in this project was the ‘Closed-loop Water Project’, which focussed on the water used to clean out production equipment between the manufacture of different paints. Previously this water was sent for treatment and purification but it is now redirected and used in the next batch of paint.

business benefits

This simple efficiency measure has no adverse affect on the colour or quality of the paint, but saves the water and energy associated with the water treatment process. It is estimated to save at least 2600 tonnes of water annually at one manufacturing site, alone. ICI Paints AkzoNobel plans to scale this up and roll it out to other sites.

Environmental Wash System
The Environmental Wash System is a mobile cleaning station, that uses water to wash brushes, and then separates the liquid waste into solid waste and clean water.

The lower image shows washings before and after using the system.

enabling innovation – building internal capacity

The paint project has generated knowledge and procedures, which, though not innovations in the material sense of the word, provide the foundations for further sustainable innovation long after it has ended.

ICI Paints AkzoNobel has made great strides in collaborating internally. The project brought together different departments like marketing, R&D and purchasing to work on sustainability for the first time.

The project has also created networks between different parts of the product life cycle: by setting up the collaboration between the core partners, ICI Paints AkzoNobel, a manufacturer, and Carillion, a paint user (see p. 17 ‘partner up – across the product life cycle’); by engaging key suppliers (p. 17); and by involving young innovators to help tackle intractable problems creatively (p. 24).

The project has introduced the companies to innovation methods like empathic research (p. 20) and systems mapping (p. 19), providing new insights and stimulating further exploration of issues, such as how to engage upstream decision-makers and specifiers of paint (p. 22), or how to improve waste management practices on-site (p. 23).

And it has led to the development of new tools for sustainable innovation and embedded them into the companies’ organisational processes: the Streamlined Life Cycle Analysis tool (p. 16); the Environmental Impact Analyser (p. 18); and the Packaging Assessment Tool (p. 21).

business benefits

Building companies’ capacity to innovate sustainably benefits their business in two key ways: it allows them to develop and launch new products and services quicker, across their whole portfolio; and by spreading knowledge widely in the organisation, it embeds this capacity and builds-in resilience.

“The value of working in a partnership that both spans the full life cycle of a product and brings unrivalled understanding of the challenges and opportunities of sustainable development was in significantly increased opportunities for innovation, some of which were not envisaged at the start of the project. It really was a case of the greater the sharing the greater the reward.”

Phil Taylor (Paints Research Associate, ICI Paints AkzoNobel)
setting a vision

The first step in sustainable innovation projects is to have a vision. This can help guide decisions, stimulate creative and innovative thinking, clarify ambition, and ensure people jump over everyday organisational barriers.

For the paint project, we created a vision of a completely sustainable paint system of the future. The partners set the goal of making paint a true enabler of sustainable construction by enhancing the life of painted materials without any negative environmental or social impacts.

The process was designed to inspire and challenge, and to stimulate action and learning. It created three aspirational long-term targets that became a reference point and a stimulus to thinking throughout the project.

Three aspirational visions for a sustainable paint system

- VOC-free paint is sourced 100 per cent from local and sustainable recycled or renewable materials and delivered with minimal and reusable packaging.
- A service of surface protection and decoration is delivered through a film-based technology that is removable and reusable.
- Substrates are pre-treated to meet the requirements of construction. Future appearance can be changed “in-situ” to meet changing needs and wants.

laying the foundations

When you are getting started on a sustainable innovation project you need to take some key steps to ensure sustainability is factored in successfully. This is on top of those things that any innovation project needs: good project management, clear responsibilities, reporting structures, clear targets and a culture that supports innovative thinking.
know your impacts – streamlined life cycle assessment (SLCA)

A critical part of the sustainable innovation process is to identify the impacts of existing products and services – how (un)sustainable they are now and the main ways they affect the environment and society.

There are a number of qualitative and quantitative tools that can help to do this, such as data-intensive Life Cycle Analysis (LCA) and single issue tools like carbon footprinting. However, methods like these can be quite detailed and time consuming, and are generally used late in the product development process. They also often miss out social and environmental impacts, which are hard to assess, such as the effect on biodiversity.

To resolve issues like these Forum for the Future developed a Streamlined Life Cycle Assessment tool (SLCA) that builds on The Natural Step Framework – an approach which identifies four holistic principles to describe the basic conditions of a completely sustainable system.

The partnership developed an SLCA tool that through testing with Carillion and ICI Paints AkzoNobel has proved to be a powerful medium to convey the impact of products or services. This tool is now being rolled out through Carillion’s supply chain to help map out the sustainable impacts of materials and services used within Carillion.”

Jas Dhami (Design Manager, Carillion)

The SLCA is a tool which generates quick but scientifically rigorous results. It identifies the major sustainability impacts of a product or process, covering the whole life cycle and all sustainability issues. It uses a series of questions relating each life cycle stage of a product to the four sustainability principles, and presents the results as a colour-coded matrix. This gives members of the innovation team a simple overview of the most significant impacts across the life cycle, helping them to think creatively about sustainability challenges and direct attention to where it is most needed.

In this project, the SLCA helped identify 25 key sustainability aspects across the life cycle of paint. This helped the partners choose the core innovation projects to tackle over the three years. Selection criteria included: the importance of the impact area; the complexity of the stakeholder relationships needed to solve problems; and whether the problem could be tackled in a short, medium or long-term project. The partners defined nine workstreams covering all five stages of the life cycle and all areas in which paint has major sustainability impacts.

There is more information about the SLCA and the Natural Step Framework on the Forum’s website.

The four sustainability principles

In a sustainable society, nature is not subject to systematically increasing:

1. concentrations of substances from the earth’s crust
2. concentrations of substances produced by society
3. degradation by physical means
4. and, in that society, people are not subject to conditions that systematically undermine their capacity to meet their needs.

10 For more info, visit: www.forumforthefuture.org/streamlined-life-cycle-analysis, and www.forumforthefuture.org/our-approach/tools-and-methodologies/TNS
partner up – across the product life cycle

It can often be difficult for a single company to reduce the sustainability impacts of a product because they occur in different parts of its life cycle – in the hands of suppliers or customers. Many of the best examples of sustainable innovation feature collaboration, partnering, or co-development across the product life cycle – involving those with control or direct influence over different parts of the system.

The paint project began as a three-way collaborative partnership. ICI Paints AkzoNobel is a developer, manufacturer and distributor of paints with a large network of suppliers. Carillion is a customer of ICI Paints AkzoNobel and an important user of paint in the design, construction, maintenance and disassembly of buildings. Both industrial partners have influence over most stages in the life cycle of paint. The third member, Forum for the Future, brought sustainability and innovation expertise, and ensured that this was championed throughout the project.

Other stakeholders, such as architects, contractors, building surveyors, waste handlers, recycling companies and policy makers, were brought into the process at relevant stages. Their stories and perspectives provided valuable insights, helping the partners to develop and test ideas.

supplier innovation

It’s important to engage suppliers in sustainable innovation – as they provide many of the raw materials, components and, often, complete products that today’s companies’ deliver. It has even been argued that sustainable innovation is actually supply chain management, as so much influence over a product’s impact can rest in the hands of suppliers.

There is a long history of working to manage sustainability risks throughout the supply chain through using supply-chain management, supplier auditing and supplier relations. But here we focus on engaging suppliers in the sustainable innovation process, rather than as a risk or cost-reduction process alone.

The paint project revealed that by far the largest impacts of paint – CO2 emissions and waste – are created when suppliers extract and process the resources that go into making it. The impact of extracting and processing materials can be as much as 10 times higher than those of paint production, placing a special importance on supplier innovation.

Forum for the Future helped launch a number of initiatives to engage ICI Paints AkzoNobel’s supply chain on sustainability issues. We worked with its purchasing team to start integrating sustainability into their core activities. We also set out to build purchasing managers’ capacity and confidence to engage key suppliers on sustainability – and designed a workshop process to help them to do this, using the Streamlined Life Cycle Assessment tool. We then helped the purchasing team hold workshops with their top five suppliers, to help them identify and manage their social and environmental impacts.

We also collected and validated data to quantify the impacts of the raw materials used in paint. This helped ICI Paints AkzoNobel to understand and manage the environmental footprint of its products. It also sent out a powerful message to the supply chain about the company’s intentions to reduce impacts, creating the basis for ongoing dialogue, and encouraging suppliers to take their own initiatives.
within the factory gates

As with supply chain management, there is a long history of companies making sustainability improvements in manufacturing and production processes by taking action on things like eco-efficiency and clean production. Sustainability improvements can come from improving the efficiency of existing manufacturing processes and reducing waste and energy use. Better still is to completely redesign a product or even to fundamentally rethink what to make.

ICI Paints AkzoNobel set out to redesign paint formulations to minimise or eliminate materials with the greatest impacts without compromising product performance. This focused innovation on the four key components of paint: pigment – such as titanium dioxide, clays and chalks, which gives the paint opacity, toughness and texture; binder – which hold the pigments together; solvent – such as hydrocarbon solvents, which influences the flow of the paint and how it dries; and additives – which can be used to modify properties such as appearance, surface tension, freezing point, and foaming.

Early assessment using the Streamlined Life Cycle Assessment tool helped flag potential sustainability problems with a number of key ingredients. For example: some of the pigments, like titanium dioxide, are very energy-intensive to produce; some of the synthetic binders, like acrylics, are based on fossil fuels, a non-renewable resource that contributes to climate change; and organic solvents, such as those used in oil-based paints, which contribute to climate change and air quality problems by releasing volatile organic compounds (VOCs).

Forum for the Future created a second tool as the project developed and required further layers of detail on the specific sustainability impacts of paint formulations – the Environmental Impact Analyser.

**what gets measured gets managed – the Environmental Impact Analyser (EIA)**

The Environmental Impact Analyser (EIA) is designed to help businesses develop more sustainable products – in this case paint. Its development represented a milestone in the creation of the Ecosure range of paints. The EIA is now embedded into ICI Paints AkzoNobel’s product development process and is used on every new project as well as to make improvements across the whole product portfolio.

Tools need to use indicators that accurately measure the most important sustainability aspects of the product. In the paints project a decision was made to focus on embodied carbon, water, waste and VOCs. The EIA assesses these impacts at each stage of the paint life cycle, from the extraction and processing of raw materials, through manufacture, and to the point where it leaves the factory. The EIA allows ICI Paints AkzoNobel to compare an existing product against a proposed new one and quantify...
PAINT THE TOWN GREEN

changes in carbon, water, waste and VOCs.

The Ecosure range offers a greatly reduced environmental footprint without compromising product performance. This was achieved by using the EIA to identify ingredients with a lower carbon, waste and water footprint; by selecting suppliers with a better sustainability performance; and by making efficiency improvements in manufacturing, such as the Closed-Loop Water Project (p 13). Changes like these helped the initial Ecosure product achieve 25 per cent savings in embodied carbon, water and waste. A year later the formulation had been improved to achieve a 35 per cent saving in embodied carbon. These new formulations are, at the time of writing, the subject of a patent application, which, when published, will give full details of the process involved.

A key factor in the success of the EIA is that it is rigorous enough to be reliable but sufficiently streamlined to be quick and useable. More information about the EIA can be found on Forum’s website.

mapping systems & processes

Mapping helps innovators visualise and describe different resource flows and relationships through the product life cycle. It is a good way to tackle key sustainability questions like ‘where does it come from; and where does it go?’ The technique can be used to identify sustainability hotspots and leverage points and to understand how different parts of the system relate to each other. This, in turn, can help to generate ideas and solutions for one part of the system, without causing new problems in another.

Paint is traditionally packaged in cans made of either steel or plastic (like polypropylene) and comes in various sizes such as 2.5L, 5L and 10L. After use, most cans go to landfill as there are currently few viable recycling schemes. Any paint residues left in the cans make them hard to recycle and leftover paint can contaminate otherwise recyclable construction materials. The physical can accounts for about 10-20 per cent of the total environmental footprint of a can of paint (depending mainly on the type of paint being used), so there is a clear need for innovation in paint packaging.

The paint project developed a series of innovations in packaging and delivery, including lightweight cans, new ringless designs making the can easier to clean out, radical bulk-packaging formats, a new recycling process and a packaging take-back service. These are described in the sections on packaging improvements (p 11) and take-back service and recycling (p 12). Here we outline the methods we used to achieve these innovations.

packaging & delivery

Packaging and delivery can have a significant environmental footprint, and they often represent the most visible aspect of a product’s impacts – where it touches customers. A company’s use of packaging can make it look good or bad, and retailers in particular have been accused of over-packaging and inefficient use of materials. However, we need to remember that packaging also brings environmental benefits – by protecting products, helping them to be transported safely, and by extending their useable life. So it’s just as important to look at optimising as well as minimising packaging.

“*The Environmental Impact Analyser has been invaluable to ICI Paints AkzoNobel in developing quantifiable metrics for our Ecosure range of paints. The skill and expertise that Forum for the Future was able to bring to the development of this tool has allowed it to be rapidly deployed in our UK business and now in other geographic locations.*”

Phil Taylor (Paints Research Associate, ICI Paints AkzoNobel)

“The dialogue with Forum has helped us widen our thinking, develop ideas and practically move forward with sustainability in packaging and distribution.”

Louise Heather (UK & Ireland Packaging Development Manager, ICI Paints AkzoNobel)

11For more info, visit: www.forumforthefuture.org/enviro-impact-analyser-intro
Empathic research is a key method used in design practice. It allows innovators to gain insights from people into how they use and experience products and services, and how they do or don’t work. It is an observation-based method with roots in ethnography and it provides deep and rich insights into actual behaviours, in contrast to traditional market research or insight methods like interviews and focus groups, in which people often say one thing and do another. Empathic research is often used to improve the function, desirability or usability of products, but in this project we used it to make products more sustainable.

Forum for the Future made a number of empathic research visits to construction sites to learn about how working conditions influence the behaviour and decisions of painters and in turn how these can be used to encourage more sustainable behaviour. Forum also conducted some detailed observation in the Dulux Decorator Centres (trade sales outlets), which helped in the design of the take-back scheme.

The involvement of stakeholders from different stages in the life cycle of paint, often overlooked in an innovation process, made it very easy to test solutions in real conditions and introduce improvements. The bulk-packaging prototype, for instance, was improved through tests on-site, as was the take-back service.

Mapping systems
The images above show the systems maps that are mentioned in the text.

The hand drawn map was created during a workshop aimed at discovering challenges and opportunities for the development of the packaging take-back service. The mapping workshop helped clarify flows of resources and information, legislative issues, safety concerns, potential areas for cost reduction and the need for internal training programmes.
packaging assessment tool (PAT) – rapid packaging assessment

Packaging and product development are often separate functions in companies, requiring separate but related methods and tools to be used for sustainable packaging and product innovation. The Environmental Impact Analyser (see p 18) was a key tool for innovation in the paint project, but we also identified a need for quicker tools to aid decision-making in packaging design.

Forum for the Future developed the ‘Packaging Assessment Tool’ to help ICI Paints AkzoNobel’s packaging design team assess existing packs and new solutions using carbon, waste and water as key indicators. The tool provides a quick way of comparing the cradle-to-gate impacts of different packaging format, material and processing options. The tool itself consists of an easy-to-use spreadsheet that allows designers and engineers to feed in data and receive quick answers. The conversion factors and data for different materials and processing options come from suppliers and life cycle databases.

The Packaging Assessment Tool was first embedded into packaging development and used for impact assessment and, more recently, has been used further upstream to screen projects before they are initiated.

“The Packaging Assessment Tool is useful as it helps us to integrate environmental issues into the decision-making process at an early stage of the design process, where there is the greatest opportunity to influence the final packaging material and format.”

Louise Heather (Packaging Development Manager, ICI Paints AkzoNobel)

during use: customer impacts

Product or service use can often create major sustainability impacts. In the life cycle of a product which uses water or energy – like a shower, a kettle, a TV, or a car – patterns of usage are likely to cause far greater carbon emissions and waste than occur in its making or disposal. New technologies can significantly reduce the impacts of the use phase – for instance, low temperature washing detergents allow people to ‘turn to 30°’ and reduce the energy consumption and carbon emissions of their washing. There may also be creative ways to influence or change behaviour: good information, training, tools and smart solutions can help educate consumers and encourage more sustainable behaviour.

In the paint project, the partners chose to focus on two sources of use-phase impact. Firstly, paint brushes, rollers and other equipment used to apply paint are often cleaned under a running tap, consuming and contaminating large amounts of water – estimated at about 25-150L per brush or roller wash.

Empathic research is an observation-based method that helps gain empathic insights into behaviours, attitudes, perceptions and experiences.
ICI Paints AkzoNobel developed the Environmental Wash System to address this problem and this was then improved in trials by Carillion's contractors (p 13).

The second, and by far the greatest impact of the use of paint, is associated with the planning, specification, preparation and application of the paint itself. If the wrong paint is chosen for the wrong type of surface, if the substrates are not prepared properly, or if the paint is applied poorly, the result can be a massive reduction in the effectiveness of the paint or in the lifespan of the painted surface. Consequently, the maintenance cycle is shortened and more paint has to be used over time, increasing the overall sustainability impacts of paint use in the building.

Ironically, this question of the efficacy and durability of paint means that relatively high emission paints with high durability may sometimes be a better choice than low emission paints with poor durability. It also means that paint coverage per litre – the opacity and spreading rate of the paint – needs to be taken into account as this also influences the amount of paint needed.

**sustainability specification**

The specification of paint – at the early stage of projects – was highlighted as a critical sustainability issue in a number of interviews with paint contractors, architects and builders. The specification largely determines how the paint job is done, and so fundamentally influences the sustainability impacts. It usually states which paint is to be used on which surfaces, the required preparation and the required quality of the final outcome – all of which influence the lifespan of the painted surface. However, it can also set standards of waste handling, cleaning of equipment, transport and health and safety. Requirements relating to road miles, paint-can recycling rates and similar sustainability considerations, can greatly influence the emissions and waste associated with the paint job.

Few paint specifications currently factor in sustainability impacts as cost is still the key factor in decision-making, both for new developments and, over time, for building maintenance. Yet more and more customers are asking important questions about how to ‘green’ their specification. In our interviews, people in the trade repeatedly mentioned the need for a source of relevant and up-to-date information on this subject and for practical tools to help integrate sustainability into the specification process.
For this project, Forum for the Future took up the challenge of sustainability in paint specification. We set out to identify tools and communication channels to help decision-makers – like architects and building surveyors – keep abreast of best practice. This project only progressed to the concept stage, but ICI Paints AkzoNobel has taken a first step in helping the industry meet this need by developing a Continuous Professional Development (CPD) course on paint sustainability specification, certified by the Royal Institute of British Architects.

So how would you get paint sustainability into the specification and how would this work in practice? The images on this and the previous page show some of our initial ideas and concepts. Produced at the latter stages of the project, these will be used by ICI Paints AkzoNobel in discussions with different stakeholders to test the viability and stimulate demand for these ideas going forward.

Our ideas on getting sustainability into the specification included for instance: the development of a holistic framework for how to include sustainability in specification; strategic partnerships with trade organisations; education initiatives; new means of communicating best practice; the development of checklists and tools for architects, building surveyors, site managers and painters.

Beyond the grave

At the end of their life many products are discarded and end up in landfill, creating waste and leading to increased resource usage and consumption. Better forms of waste management now exist, such as waste reduction, product reuse and recycling, but there is a long way to go. The UK creates around 272 million tonnes of waste per year and about 73 million tonnes of this is sent to landfill.

Waste is a huge issue in the construction and demolition industry, which discards around 90 million tonnes annually. A typical large building site sends about half a tonne to landfill every day and the sector generates an estimated one third of all the UK’s hazardous waste. Paint creates problems in the waste handling process, although it is difficult to quantify how great a contribution it makes to the overall problem of construction waste. Leftover paint residues make paint cans difficult to recycle and also risk contaminating waste that could otherwise be reused or recycled. At the end of a building’s life or during refurbishment – typically 30-60 years after construction – painted surfaces can cause waste handlers to send timber and other materials to landfill instead of recycling because the old paint may contain hazardous substances like lead (which was only banned in decorative paint in the UK in 1992). In this way, paint acts as a barrier to better waste management and material recycling.

There are many initiatives in the construction industry to tackle this problem, and the government and leading companies have set targets to halve the amount of waste being sent to landfill by 2012. The paint project partners undertook two main activities looking at how to reduce waste sent to landfill because of paint. First, ICI Paints AkzoNobel and Carillion launched a trial to test whether bacteria involved in industrial composting processes can break down potentially harmful substances in old painted timber. If tests prove successful, this could reduce the amount of timber being sent to landfill. The second initiative looked at how behaviour change on construction sites can reduce waste.

---

university challenge – on waste

The initiative to improve waste handling on construction sites, started with empathic research (p 20). Forum for the Future made a number of site visits and observed how construction crews handle waste and the reasons for their actions. It became apparent that while most crews do their best to follow specified waste management plans, there are a number of practical barriers to better waste handling. For example, contractors are expected to separate their waste into different skips placed in central locations, but a lack of clear information on what each skip should contain often causes waste to be mixed. This is compounded by the way the waste is moved around, from small bins to large skips, where it can also get mixed. Time pressure and competing contractors’ interests on-site also add to the problem.

Using the above insights, Forum for the Future ran a challenge with a group of design students to develop concepts to tackle some of these issues. A three-day workshop resulted in two innovative new concepts for ways to improve waste handling, which included proposals for new signage systems (see the image below), behavioural incentives and methods for collaborating around waste. One of the student groups sketched out a signage system to reduce confusion over what should go in each skip. They suggested setting up a professional development scheme to educate the trade about waste. And they proposed creating site-waste management teams with representatives from each subcontractor on-site, to ensure that responsibilities were clear and any waste handling issues were resolved quickly.

Design challenges like this – on almost any subject – can be a great way of generating ideas by giving a real-world problem to hungry young innovators.

“The university challenge took place with students at the design school at Växjö University in Sweden. Over three days of intense workshops the students developed insights into the challenges and inspiring ideas for how to solve them.”

Jas Dhami (Design Manager, Carillion)
We hope this publication has convinced you of the value of sustainable innovation. We’ve explained how and why to set up and manage a sustainable innovation project and discussed tools and methods which can be used. If you’re itching to get started on a real project, what do you do next?

You can, of course, use any of the tools and methods we describe in this report – such as system mapping, engaging with suppliers or university challenges – to achieve a more sustainable outcome in existing innovation projects.

However, if you are wondering how to kick off a larger and more ambitious project like the one described here, we have produced a five-step method to replicate the innovation model we used.

### making sustainable innovation happen

The section on sustainable innovation in action explains how to ‘lay the foundations’ (p 15) for a successful project. It describes how to set a vision, know your impacts and other important activities. Here we describe how to put them together as a series of five steps.

<table>
<thead>
<tr>
<th>step</th>
<th>what &amp; why</th>
<th>what we did</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Define problem(s)</td>
<td>Define the specific environmental or social problem you are trying to tackle.</td>
<td>In our project, steps 1 &amp; 2 were not sequential, but parallel and iterative steps: as we defined the problem it became clearer how the partnership would have to work; and as the partners started collaborating the problem became clearer. - Our first problem was the costly and wasteful landfill of paint cans immediately after their use on a construction site. This helped highlight a series of larger, structural problems inherent in current systems of paint manufacture and use (p 8). - Our three-way partnership featured: ICI Paints AkzoNobel, the supplier; Carillion, the paint customer and user; and Forum for the Future, the sustainability &amp; innovation experts (p 17).</td>
</tr>
<tr>
<td>2. Partner up – across the product life cycle</td>
<td>Collaboration and co-development are essential to sustainable innovation. Form partnerships with those directly involved with your problem – suppliers and customers – or those with potential for the solution.</td>
<td></td>
</tr>
<tr>
<td>3. Know your impacts – conduct a sustainability assessment</td>
<td>Make a strategic sustainability assessment of the key environmental and social impacts of the system on which you are focussing.</td>
<td>We assessed the life cycle of a standard, high volume can of paint, using the Streamlined Life Cycle Assessment tool – which Forum for the Future developed specifically for this project (p 16).</td>
</tr>
<tr>
<td>4. Set a vision – of your sustainable product-system</td>
<td>How would your product or service become totally sustainable? Following directly from the impacts assessment, define a vision for the 100 per cent sustainable product-system.</td>
<td>We created three visions for sustainable paint, described on p 15.</td>
</tr>
<tr>
<td>5. Define projects - and getting going</td>
<td>Determine a series of manageable and achievable spin-off projects to tackle the major impacts and work towards your vision. These should be cross-functional and multi-disciplinary projects. Treat your projects as normal innovation or R&amp;D projects and run them as separate, but connected work streams.</td>
<td>We worked on the nine separate, but connected projects, over a three-year time period that covered the key impacts across the full life cycle of paint.</td>
</tr>
</tbody>
</table>
innovation at Forum for the Future

Forum for the Future researches and promotes sustainable innovation and supports practical innovation projects. We want sustainability to become the central organising principle for innovation in the 21st century.

We use futures methods to generate new ideas and concepts for the products and services, initiatives and schemes that will win in the 21st century. Low Carbon Living 2022\(^{13}\) highlights products and services we could be using in a future where we lead low-carbon lifestyles.

We get people to see the world in new ways and encourage fresh thinking in innovation processes by bringing together people with different perspectives and involving external innovators. We worked with design consultancy IDEO in the i-team\(^{14}\) project, helping local authorities develop innovative methods to tackle climate change.

We assess the sustainability of innovations and highlight their key environmental and social impacts, both positive and negative. Our Business Models for Sustainable Consumption\(^{15}\) project produced a tool for developing business ideas, which satisfy needs in more sustainable ways.

We work to enable and accelerate sustainable innovation, ensuring it happens systematically in our partner organisations and raising its profile in the wider innovation community. We raised awareness of green innovation within business by launching the Climate Change Challenge\(^{16}\), a global competition for innovations designed to address global warming, in partnership with the Financial Times.

For more information contact Chris Sherwin, Head of Innovation
c.sherwin@forumforthefuture.org

\(^{13}\)www.forumforthefuture.org/projects/lowcarbonliving2022
\(^{14}\)www.forumforthefuture.org/the-i-team
\(^{15}\)www.forumforthefuture.org/projects/sustainable-business-model-tool
\(^{16}\)www.forumforthefuture.org/FT-climate-challenge